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Supervision, R-2
Distribution Policy Survey

A SURVEY OF RANGE ECONOMIC CONDITIONS

AND DISTRIBUTION PROBLEMS

YAMPA RIVER DRAINAGE

COLORADO

REGION TWO

1935-1936

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VI. SUMMARY AND RECOMMENDED POLICIES

SUMMARY OF FACTUAL SECTIONS OF REPORT

Introduction

Distribution policies cannot remain static. Policies must keep pace with shifting economic situations. The distribution policy survey was undertaken in recognition of these facts and is an effort to determine policy through a study of range and agricultural conditions.

Numerous factors have a bearing on the distribution problem. The most important influences appear to be:

- (1) Overstocked spring-fall and winter ranges and maximum production of hay and other winter feeds.
- (2) The relative desirability of national forest ranges.
- (3) Land policies which encouraged homesteading irrespective of proper land use.
- (4) Changes in farm management practices.
- (5) Competition between different classes of livestock.
- (6) Resistance of ranchmen to change of methods.
- (7) Demands by interests other than livestock.
- (8) The land value and tax problem.
- (9) Possible profit through sales with waiver.

The lack of balance between livestock numbers and carrying capacities is probably the most aggravating influence of those mentioned.

The extent of the distribution problem in the Yampa River area is indicated by livestock population compared with numbers grazed on national forests. There are 1,200 cattle owners with 49,000 range cattle. Eight per cent (164) of the owners hold permits for 28 per cent (13,000) of the cattle. The average cattle permit is for 79 head. Thirty-one per cent (89) of all sheep owners (285) hold grazing permits for 43 per cent (138,000) of the 318,000 sheep which grazed in the area. The average sheep grazing permit is for 1,558 head.

Description of Unit Studied

The Yampa River drainage, containing four and one-quarter million acres, in Colorado was selected because of an outstanding distribution problem. Improved ranch operations with a long winter feeding season, low altitude winter ranges, keen competition for range between cattle and sheep and interstate relationships characterize the unit. Conditions are comparable to much of the Western Slope of Colorado.

Parts of the Routt and White River National Forests are included in the study area.

Characteristic of the climate are the short growing seasons at the higher elevations which limit agricultural practices; the low annual precipitation (10 to 12 inches) at the lower elevations with attendant hazards for agriculture; and the long winter and heavy snowfall (160 to 180 inches) in the upper areas, forcing a long hay feeding season.

The population is 14,200 people. There are 3,990 families with an average of 2.9 people each. Agriculture supports 42 per cent of the population and coal mining 18 per cent. The prosperity of the remaining 40 per cent is very largely dependent on these two basic industries.

The principal natural resources are tillable lands, range lands, water, coal, oil, timber, game, and recreational features.

The Agricultural Situation

One-half of the farms now in the area are crop farms with a few head of stock. Over half of these crop farms have less than 50 acres of crop land and less than 10 per cent have 90 acres or more. About 10 per cent of all farms have sheep and one-third of these have small farm flocks.

42.5 per cent of all farms had less than \$1000 gross income in 1935, and 74 per cent of all farms had less than \$2500 gross income, yet the remaining 26 per cent produced 70 per cent of the total gross agricultural income.

Crop yields are highest in the eastern portion of the area and lowest in the western part. However, average yields are fairly high when compared with general averages. The amount of principal crops sold is about as follows:

Tame hay, 12 per cent; alfalfa, 52 per cent; wheat, 72 per cent; other grains, 29 to 35 per cent; potatoes, 64 per cent.

Forage yields are also highest in the eastern portion. The average rate of stocking actually used is one animal unit for one month on 3.14 acres. This is equivalent to one ewe and lamb per .78 acres in summer and one ewe to .52 acres in winter. The average season of use of private range is from April 15 to November 15.

The average cattle ranch in the area has a breeding herd of 153 head of which 92 are cows and 2-year-old heifers. An average of 60 calves are branded each year. The average calf crop is 65 per cent and the average annual loss is 3.4 per cent. The most common sales practice is to market long yearlings. The average sales are 264 pounds of beef per head of stock in the breeding herd. Ranchers in the eastern portion of the area sold 286 pounds per head and those in the western portion dropped as low as 220 pounds, with possible averages in the extreme west end of 200 pounds or lower. Death loss is 1.2 per cent higher in the eastern portion, probably due to the presence of larkspur on those ranges.

The calf crop is on an average 7 per cent higher on irrigated pasture and 10 per cent lower on national forest range, than on good private range. It is somewhat higher on public domain than on national forests.

Most of the sheep are on the range the year round; a few farm flocks are kept on feed as well as some up to a band or so. The east portion of the area is not well suited for wintering sheep because of deep snow and the prevalence of disease and foot-rot, due largely to climatic conditions. Some sheepmen raise their own replacements, others purchase them. Average results of various sheep operations are about as follows:

	<u>Farm</u>	<u>Winter</u>	<u>Winter</u>
	<u>Flocks</u>	<u>Feeding</u>	<u>Feeding</u>
Average Number Sheep	134	1331	6094
Per Cent Lamb Crop	104	92	82
Lamb Sales Per Head, lbs.	72	60	52
Wool, Pounds Per Head	8.2	7.9	9.2

In comparing returns per head as between cattle and sheep ranches it was found the average beef production was 318 pounds per animal unit, while on the sheep ranches it was 265 pounds of mutton and 43 pounds of wool per animal unit. If average sheep prices of \$8.00 per hundred, and wool prices of 22¢ per pound are used, the income per animal unit for sheep is \$30.66. For cattle to equal this income, the sale price would need to be \$9.65 per hundred. The income from irrigated pastures is about the same for

both classes under average prices, considering a 20 per cent increase in beef production and assuming that wool will maintain its relative level.

On the basis of budgets presented, none band units which are winter fed show a \$990 greater return over similar units grazed on winter range. This return probably is not possible if larger outfits are winter fed.

Tax delinquency is higher in Moffat County than in Routt County. Since delinquency was extremely high in prosperous years as 1929, it is due to the inability of lands to pay. In 1932, 75 per cent of the area and 72.7 per cent of the valuation of agricultural lands was tax delinquent in Moffat County.

In studying return from land, average long-time prices and average operating costs show \$4.96 per animal unit on cattle operations and \$14.16 per animal unit on sheep operations available to pay for use of the investment in real estate and improvements. Cattle can earn 5 per cent on \$2.60 grazing land, and sheep, at the same interest rate, can support a \$7.40 valuation. Cattle can support \$41 hay land and sheep can maintain a \$116 valuation on hay land. Earnings on land are 34¢ per cow month and 27¢ per sheep month. An operation with 60 per cent lamb crop can support one-half the land value as compared with an 80 per cent lamb crop. Taxes now absorb about 54 per cent of the land income.

The indicated fees for use of public ranges are 21¢ per cow month and an average of 12¢ to 15¢ per sheep month. A graduated fee would be 23¢ per sheep month when lambs are 8¢; 19¢ when lambs are 7¢; 10¢ when lambs are 6¢; and 4¢ for 5-cent lambs. The basis used for figuring fees assumes that earnings are spread uniformly throughout the year. On this basis, fees would be the same on public domain as on the forest.

As a class, dry farm operators and small crop farmers cannot use public ranges effectively. Small livestock ranches can use such range, but the larger sheep and cattle operations are able to make the most efficient use of national forest and other public ranges.

It was considered that any farm or ranch which is incapable of earning \$50 per month, the equivalent of going farm wages, without earning interest on investment, is definitely sub-marginal.

There is need for a definite policy to govern use of state and county lands. Such lands should be properly managed. The competitive bid system of leasing is not conducive to conservative use. Taxes on private lands should be adjusted to some share of what the land earns.

The Range Situation

Early use of ranges was exclusively by cattle from southwestern states. The first use of ranges by sheep was in 1908 when unused areas within the Routt Forest were opened to this class of livestock. Cattle on ranges outside of the forests began to give way to sheep following the World War. This shift from cattle to sheep continues due to the more favorable economic position of sheep.

The cattle population reached a recent year peak in 1918 with 90,000 head. Present numbers are about 54,000 including dairy stock. The present sheep population is about 318,000, varying seasonably.

Twenty-nine per cent of the range cattle grazed on national forests in 1935. Practically all cattle are wintered on hay. Fifty per cent of the sheep which summered in the area used national forest range. Sixty-two per cent of the sheep which summered in the area moved to winter ranges outside of the Yampa River drainage. Of those which wintered in the area, 31 per cent were fed hay. The remainder went to Moffat County winter ranges.

On the basis of area, 35 per cent of the summer range in the study unit is within national forests; on the basis of estimated carrying capacity, 37 per cent; on the basis of present use, 29 per cent.

National forest ranges are generally better adapted to use by sheep than by cattle. Better summer cattle range is located in foothills outside of national forests. These foothill ranges are now largely used by sheep.

Sheep have been successful in competing with cattle, due to more favorable economic position of the former.

The total use by all classes of grazing animals, exclusive of calves and lambs, of all feeds and forage in 1935 amounted to 1,372,560 cow months, divided as follows: grazing lands, 962,587 cow months; hay and grain, 365,649 cow months; and crop aftermath, 44,324 cow months. Thus, 70 per cent of all feeds was supplied by natural forage; 28 per cent by hay and grains; and four per cent by crop aftermath.

Comparing actual use of ranges with estimated carrying: (1) Summer ranges outside national forests are stocked at the rate of 2.86 acres per cow month against an estimated capacity of 4.2 acres per cow month. The indicated overstocking is 31 per cent. (2) Spring-fall ranges are stocked at the rate of 7.32 acres per cow month as compared with a requirement of 13.0 acres per cow month. The indicated overstocking is 43 per cent. (3) Sheep use only on winter ranges is at the rate of 1.1 acres per sheep month against an estimated requirement of 3.0 acres per sheep month. The indicated overstocking is 63 per cent. This comparison emphasizes the extent to which the distribution problem is aggravated by overstocked ranges.

If reductions are made they probably should fall heaviest on sheep because a large proportion of the sheep are wintered on overstocked ranges while cattle are wintered on hay. Such an adjustment would release foothill summer range for cattle.

Average hay production balances approximately with present requirements.

In general national forest summer ranges are in good condition. In fair condition are other summer ranges in the area where overstocking has not been continued too long. Soil and moisture conditions in the summer range area favor rapid recovery of forage. Sagebrush makes up the bulk of the ground cover on the Moffat County spring-fall ranges. The more palatable species have been largely eliminated by over-use. Rehabilitation under adjusted use will be less rapid than on summer ranges due to lower precipitation and less favorable soil conditions. Much of the forage in the winter ranges is in a weakened condition and the density of the more palatable species is being reduced. The need for adjustment of numbers is outstanding.

No appreciable active erosion is in evidence at the higher elevations in the Yampa River drainage. The intermediate and lower altitude ranges are suffering from marked acceleration of sheet and gully erosion, the fertility of the topsoil is being lost, and serious and rapid inroads into the productivity of range are being made.

The cultivation of lands for sub-marginal dry farming operations is a common form of land misuse.

Isolated ranches increase the cost of public service. This increased cost or subsidy is paid by the taxpayers of the more populous areas.

On all ranges properly stocked with domestic animals there is still room for a certain number of wildlife, because of waste range which is inaccessible to or unused by livestock. Determination of wildlife numbers to be produced on an area should in general be in harmony with such range capacities. Existing forms of land use must also be considered as well as public demand for game. In the past, lack of control of the kill has had more to do with present numbers of game than range conditions.

Recreational use of national forests can be segregated into extensive and intensive types. The extensive type includes hunting, fishing, sight-seeing and similar activities. Use of this type will have no effect upon the supply of range for domestic livestock. The intensive type includes highly specialized forms of use incident to public campgrounds, picnic areas, resort sites and summer home sites. Plans for the development of the intensive type of recreational use must provide for the exclusion of domestic stock. The effect of such developments on numbers of livestock will usually be imperceptible.

Restriction of grazing on young timber plantations is needed, as well as on areas supporting stands of young ponderosa pine.

Watershed values of the Yampa River drainage are exceptionally high. Range distribution policies must take into account the public needs for watershed protection.

Turnover in Grazing Permits

An analysis of the grazing permit history in Region 2 included 2,308 closed sheep cases and 626 closed cattle cases. This analysis indicates increasing stability as the size of the band or flock increases. While a heavier permit turnover in the smaller sized groups is to be expected, since there are now and always have been more stockmen using forest range with small numbers than with large numbers, the ratio of the number of permits in effect in the small group to those in the larger groups as compared with the ratio of the small group turnover to the large group turnover indicates relatively greater instability of the smaller units.

The turnover study refutes the allegation that past distribution policies have "frozen" the grazing privilege in the hands of a few permittees. Comparing 1954 with 1915, the number of sheep grazing permittees increased 114 per cent with a 35 per cent increase in the number of sheep under permit. The number of cattle permittees decreased one per cent and the number of cattle under permit

decreased four per cent. During the period large areas of cattle range were eliminated from national forests for homesteading.

The permit turnover during the same period amounted to approximately 14,000 cases.

Instability seems to be an inherent characteristic of the small livestock business in the Rocky Mountain Region.

Termination due to inadequate financing or to speculation, seems to increase, particularly with cattle, as the size of the operation increases.

Failures due to inexperience and poor management increase with size of operation.

The tendency to shift from cattle to sheep is more definite than the tendency to make the opposite shift.

An important reason for permit turnover is disillusion of the permittee who expects great return from what appears to be low-priced range.

Physical characteristics of national forest ranges and adaptability of the range to classes of stock are important factors in their relation to policy if greater stability of the permittee is the objective.

Distribution policies have been in harmony with governmental policy concerning the disposition of public lands which included encouragement of "homesteading." Land policies have changed but this did not occur until distribution of land for home building had gone too far. Too many people settled on poor land which can never be made to support a family satisfactorily. These sub-marginal operations cannot be made satisfactory through distribution of national forest range. Instead, the indication is that future policy should promote stability and be in harmony with sound land-use policies.

Dependency

Dependency relates to the need of certain seasonal resources for resources available at other seasons to produce a yearlong balanced operation. Actual dependency is largely the result of established use. Potential dependency is expressed as demand. Since normally only a part of all available summer range is included in the forest, a decision must be made as to what applicants are most dependent on forest range, and which applicants cannot

be admitted and must use other summer range. Accordingly, various qualifications have been applied to segregate the best qualified applicants to share in the use of the range. Since the allotment of privileges should be based very largely on the needs of dependent lands, these qualifications have been applied to lands, as differentiated from personal qualifications. Such relative qualifications are: (a) Land is most dependent if stock raising is its highest use and where alternative use is not possible. One alternative use is the development of irrigated pastures; (b) a ranch of a desirable size, providing adequately for sufficient stock to furnish a reasonably good income is better qualified than one too small or larger than necessary; (c) valuable land is better qualified than less valuable land; (d) land which is put to its highest and proper use is better qualified than land not so used; (e) ranch lands are better qualified if they are so situated as not to be able to use other summer range as effectively as forest range; (f) these provisions presume that in all cases a ranch within the general zone of dependency is more dependent than one outside such zone. The zone of dependency for this study would include that part of the Wyoming Desert now dependent upon the Colorado forests and Colorado west including the winter range and south to the White River, Yampa Divide. Waivers involving permits outside such dependency zones should not be recognized unless the waiver brings the operation within such zone.

Commensurability

Commensurate property means property of the kind and amount necessary to furnish feed or forage for the class of stock in accordance with the actual requirements in the locality during the portion of the year when it is not grazed upon the national forest. Commensurability must be based upon proper or conservative use of the resources, not upon the custom of the community. Only crops, hay or forage necessary to the livestock operation and used in connection with it will be considered. Cash crops, as grain, are not to be considered. In most operations there is a critical period, as in spring, where spring range is adequate. To the extent that resources, available at other seasons, cannot be shifted to use during such a critical period, the amount of commensurability during any critical period will represent the maximum amount for which the operation is commensurate. That is, resources will be considered only for the season when they can be used, and all resources will not be lumped and divided by the time the stock is off the forest. It is recognized that the average ranch operation leases some land or may have a license on a grazing district. Consequently, an outfit should be required to own a substantial portion of the commensurate lands or resources used

when stock is off the forest. (50 per cent in the case of the Yampa area). The amount to be determined for each locality. Sufficient resources must be controlled either through lease or license or otherwise to make up the balance required in the year-round operation.

Commensurate lands should be properly used--they should be properly stocked and used at the proper season. The crowding of additional stock on such lands or their use at seasons other than those contemplated when they are rated, except by agreement between the permittee and Forest Supervisor, will be sufficient grounds to cause them to be dropped from consideration as commensurate property. To avoid arbitrary requirements and arbitrary action will require an agreement in which the permittee or applicant stipulates the amount of the various resources available and how and when they will be used in the operation.

Commensurate lands must be complementary to the forest summer range, not supplementary. Actually the control of outside summer range detracts to that extent from the dependence of the winter-spring-fall resources and should be deducted therefrom in order to arrive at the balance which may be dependent on the forest.

Types of Livestock Organizations

The prevalent types of organizations for the production of livestock are included in the following:

- The individual
- Father and son
- Two or more brothers
- Family corporations
- Partnerships
- Corporations

Analysis of seventeen corporation and partnership permittees disclosed that ninety-three individuals owned corporate stock. The three principal stockholder groups were:

- Heads of families dependent on corporation earnings -----22
- Stockholders owning one per cent or less stock----24
- Stockholders owning two to 24 per cent of stock--47

Interlocking ownership occurred among eight of the seventeen corporations.

Economic and social merits of one type of organization as compared with some other one have no relationship to distribution policies except in connection with maximum limits. Corporations and partnerships are usually in a position to command better financial arrangements and managerial counsel than the individual. It is therefore desirable to provide a measure of protection for the individual and at the same time insure equitable distribution for the corporation or partnership by adjustment of limits.

Submarginal Operations

Due to the limited amount of forest summer range, the great mass of very small outfits cannot be substantially aided. The problem is one of too many ranches for the amount of range available. It is considered best to make range available to sound livestock operations, in units of a size needed to produce a reasonably satisfactory income.

The Use of National Forest Range to Provide a Source of Income for Families and for Other Purposes

Of fundamental importance is action to restore and preserve the range by halting overgrazing. This is related to the social problem in that the results of any system of range use will ultimately affect merchants, bankers, and service groups, as well as the rancher.

Competition for public range is keen and without some restrictions the grazing privileges might eventually be monopolized by a few strong outfits. A maximum limit is needed to prevent such a condition. This limit should be low rather than too high in order to permit as many as possible to share in the use of the range with some leeway for variation in operation. Such a policy will provide for the maximum number of satisfactory operations.

Commercial use and individual use have many points in common. The maximum limit provides the necessary restrictions.

Recreation areas where the intensive type of use prevails should be protected from livestock grazing. Areas used extensively by recreationalists need not be treated differently, in managing livestock, than other range areas.

Wildlife. Livestock grazing may need to be restricted on areas where certain type of intensive wildlife use exists. When extensive wildlife use exists, restriction of livestock on properly stocked ranges will ordinarily not be necessary.

Watersheds are usually adequately protected with proper stocking of ranges. Exceptions may be steep, easily eroded slopes on very valuable watersheds.

Timber. Temporary protection of plantations from livestock grazing is necessary for best results. Temporary protection may also be necessary to protect natural reproduction of species susceptible to injury.

Boundaries of Political Units

The boundaries of political units have never seriously influenced distribution policies, principally because dependency of lands and such boundaries are not related.

The winter ranges in Wyoming are in a status of real dependency on summer range. Dependency on Colorado ranges has been established through years of use. This dependency does not, however, exceed the carrying capacity of the winter range lands offered as commensurateness.

Taxes, Land Values and Grazing Fees

The average tax on range lands in this area is 8¢ per acre. One-fourth of the grazing fee, which in the case of sheep amounts to one-fourth of 6¢, or 1½¢ per sheep, month, is returned to the counties in lieu of taxes on forest lands. This amounts, roughly, to 1.6¢ per acre. However, Federal grants, forest road construction and maintenance, and restriction of settlement tend to compensate this low return. It appears that there is a differential, however, which may create some inequalities between permittees and non-permittees, or local residents and out-of-state permittees.

While expenses of local government may be limited, there is also evidence that some functions of government, such as road and school maintenance, are of a low standard and may be inadequately financed. There is a need for a reduction in taxes on private land to raise the operator's return.

Some of the evils and inequalities of taxation, especially those involved in interstate use, might be eliminated by shifting most of the taxes from land to livestock.

The charge that sheep use has lowered the tax base is not supported by facts. It indicates flaws in the system of assessment and a former tax base built on unsound settlement and agriculture.

It is shown that sheep can support going land prices of \$7.40 per acre and lease prices of 20¢ to 30¢ per acre. Cattle can support values to about \$2.60 per acre and cattle ranchers find it practically impossible to compete with sheepmen for private range. It is considered that the managerial return in the budgets is rather low and that this could be increased through lowered land prices. There seems to be no effective instrument to bring about lower land prices at this time.

The data show that forest fees are about one-fourth to one-sixth of the actual return from forest ranges. Indications are that the returns from sheep summered on the forest may be as much as \$600 per band higher than from other summer ranges. The low fee allows the permittee to bid a higher price for other range lands and stay within his budget, thus placing him in a very favorable competitive position. This increases the disadvantage of the non-permittee who does not have forest range to scale down his expenses.

In view of the increased stability offered under the new policy such advantages of the permittee will be increased. It may lead to speculation in permits through waivers.

receipts and

The disparity between cost of range administration and improvement should be eliminated. At present it may be regarded as a form of subsidy. Such a subsidy is not warranted in view of the fact that future permits will be issued to sound operations.

Qualifications of Applicants

Full Citizenship should be a requisite to secure a grazing preference.

Ownership vs. Tenancy. Where vacant range exists which is not in demand by applicants otherwise qualified, temporary use by tenants should be allowed.

Residence. Under the proposed distribution policy, actual residence on land need not be a prerequisite to qualify for a grazing preference.

Numbers of Stock Owned. The number of livestock owned has no particular bearing on the relative qualifications of permittees or applicants.

The classification of applicants as Class A, Class B, and Class C would be unnecessary under the proposed policy.

Limits

Under the proposed policy the protective and exemption limits are discarded. Only the maximum limit, to prevent monopoly, is retained. Present maximum limits vary from 1,200 to 6,000 sheep and from 75 to 1,000 cattle.

In the case of present permittees, it is recognized that dependency has been established through use, and reductions of permits to a low maximum limit will involve some difficult adjustments on the part of permittees. Consequently, the present maximum limit of 6,000 sheep and 500 cattle on the Routt and 600 cattle on the White River is to be retained to apply to established users for the balance of the ten-year term permit period. In other areas, the proper limit should be established depending on local conditions.

For new permittees and those desiring increases a lower maximum limit is proposed. This will vary in different localities but a limit of 2,000 sheep is recommended for this area because of the disparity in returns between cattle and sheep the present limit of 500-600 cattle is to be applied to all permittees, old and new.

At the end of the ten-year period the new maximum limit will govern, displacing the old one entirely.

It is recognized that in the case of certain corporations and partnerships involving several families a greater income must be provided for and it is recommended that the maximum limit may be waived in multiples of such a limit according to the number of families involved up to the maximum limit for established users.

Waivers of Preferences

The present policy of recognizing waivers with the sale of either ranch property or livestock is satisfactory. Reductions when transfers are made should be limited to those needed for range protection, except where reductions for distribution will expedite adjustments where permitted numbers exceed maximum limits.

Basic Objectives

1. It is a primary obligation of government to secure such use of the natural resources of the nation, as to yield the maximum, permanent, public benefits.

2. A fundamental objective is to encourage stability in the use of natural resources consistent with the relative importance of different resources and the public interest.

3. The allotment of grazing privileges should be based on the economic need for range to promote sound livestock operations without monopoly.

A SUGGESTED RANGE DISTRIBUTION POLICY

1. No reductions will be made hereafter on preferenced permits within determined maximum limits to admit new applicants. A permittee with preferenced permit above the maximum limit will be given a specified number of years to sell and waive those numbers above the maximum limit.

2. New applicants hereafter may obtain permits on fully occupied range at the discretion of the Forest Service by purchasing the livestock or commensurate property or both from a present permittee who is willing to relinquish his permit in whole or in part by signing a formal waiver.

3. Where vacancies exist or occur in the occupancy of the range, not needed for range protection, new applicants may be admitted without purchase unless one or more present users need increases because of the relatively small size of their permits. A drawing shall be held in either of the above cases for the division of the range in units designated by the Forest Service, among those applicants or users entitled to the privilege.

4. Present permittees or new applicants will be required to meet dependency and commensurability requirements specified. In this connection it is recommended that range or crop land be required within certain distance limits (dependency zones) to provide feed for a certain part of the time they are not on the forest, for example - 50% in the Yampa territory. Leased land and Taylor Act land would be additional to this minimum ownership requirement and one or both (or owned land) would be required to complete the period off the forest.

5. After the initial permit is issued it will be validated each year at the discretion of and in accordance with regulations of the Secretary of Agriculture.

6. Needed reductions at the discretion of the Forest Supervisor may be made for range protection not exceeding ten percent in any year or thirty percent in any five year period. Any increase in capacity at a later date as a result of such reduction will be returned to the range concerned and if feasible to the individual reduced.

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INTRODUCTION

THE RANGE DISTRIBUTION PROBLEM

Ever since the national forests were placed under the administration of the Department of Agriculture in 1905, the distribution of grazing privileges has been a persistent problem.

Essentially, the problem is one of dividing a limited supply of range among an over-supply of potential users in such a way as to most fairly meet the demands of the latter and, at the same time, provide adequate protection of the resource and a maximum contribution to the general welfare of the country.

HISTORICAL BACKGROUND

In order to fully visualize this problem, a brief historical background is needed.

From the time of the first known livestock operation in the region, in 1846, until 1866, the local grazing industry was in the experimental stage. The business comprised but a few cattlemen who found a market for their beef in the new mining camps. Early records bear ample testimony that these pioneers found the region amazingly rich in nutritious grasses capable of producing high-grade beef in a short time. The era was significant in that it demonstrated the stock-raising possibilities of the region and paved the way for the phenomenal development to come later.

From 1867 to about 1889, the second period in the history of the grazing industry, occurred the "boom days." On the former date, the first trail herds were brought in from the Texas ranges, which were practically running over with cattle. The chances for profit by fattening these Texas feeders on the abundant free grasses of Colorado and Wyoming ranges did not long go unappreciated. The business was just getting into its stride in 1871 when 600,000 head of cattle were trailed from Texas to Colorado and Wyoming. Despite occasional heavy losses from hard winters, the profits were generous. In the late 70's there started that scramble of capital to get into the game which culminated in the boom of the early 80's. Early records tell us that from 1870 to 1882, the number of cattle in the West grew from 500,000 to 30,000,000, and the price of good steers advanced from \$15 to \$40. The ranges were exploited and the possibility of there being a limit to their capacities was unthought of.

Although during this period a few outfits started raising hay as insurance against hard winters, the general practice was to run cattle on the range year round. The number of cattle reached its zenith about 1889.

Several factors made this high position of the industry in 1889 untenable. Fencing of water holes and development of the better agricultural lands under the Homestead Act of 1862 had progressively limited the amount of open range. Wintering on some ranges had proved impracticable by reason of heavy losses. But more important than any single cause was the material reduction in carrying capacity caused by the heavy grazing of the "boom days."

An era of deflation and adjustment to changing conditions was inevitable. Just such a period, the third in the industry's development, was experienced from 1890 to 1916. Homesteading continued inexorably to further limit the amount of open range. The Enlarged Homestead Act of 1909 speeded up the process by increasing the available acreage from 160 to 320 acres. Despite determined opposition by the cattle interests, sheep became firmly entrenched in the grazing industry. Big cattle companies, in an effort to maintain their position, resorted to various methods of land acquisition. The period was characterized by the keen competition for grass among a variety of interests, and by the consequent more intensive exploitation of the huge areas of unappropriated and uncontrolled public domain. Simultaneously, the Forest Service started on a program of applying range management to the lands in the national forests. By 1916 two significant adjustments had been made; first, sheep had gained control of most of the lower winter ranges and many of the higher summer ranges best adapted to their use; second, cattle use had been confined more nearly to adapted ranges, lying between the hay ranches and the high natural sheep ranges, and winter feeding of cattle had become common practice. Important, too, is the fact that the fencing of the natural spring, fall and summer cattle ranges had not yet reached appreciable proportions.

From the passage of the Stock-Raising Act of 1916 to the passage of the Taylor Act in 1934, the industry may be said to have gone through a second period of adjustment. The former law resulted in the fencing of much of the cattleman's natural range; and gave the sheepman an opportunity, through homesteading, leasing and purchasing, of installing his flocks on lands better adapted to cattle use, from the standpoint of topography and forage, than ranges at higher elevations. Needless to say, this law did far more to encourage land acquisition by the stronger stock interests than it did to encourage home building. The unrestricted competition for grass and resultant range deterioration, characteristic of the first adjustment period, were intensified during these years. Decided overstocking of many ranges occurred. Sheepmen resorted to the feeding of concentrates on many winter ranges to supplement native forage. Maladjustments of range use became common. The grazing of sheep on ranges formerly

used by cattle deprived hay ranches best adapted to winter feeding of cattle of their supplement of range. Erosion of soils assumed serious proportions. As a correlary to these events there grew up, both on the parts of the more progressive stockmen and of the general public, a consciousness of the values at stake. The stockmen saw the future of their industry menaced; the general public awakened to the realization that water supplies, wildlife and other interests were being threatened. Public demand for regulation culminated in the passage of the Taylor Act in 1934.

ANALYSIS OF THE PROBLEM

What bearing do all these developments have on the present day distribution problem? For the sake of clarity we shall enumerate the phases involved in the problem and explain them in the light of their background where applicable. Let it be understood, however, that the following aspects apply to the region as a whole and that their relative individual importance varies greatly on different forests, dependent on local conditions.

(1) Unrestricted use of the vast areas of public domain and the maximum production of hay and other winter feeds have tended to increase the demand for national forest ranges from all classes of stock. The reason is obvious. National forests include a large proportion of the better summer ranges and on them the numbers permitted are limited by the dictates of good management. Balanced against these summer ranges are the large areas adapted to spring, fall and winter use upon which little or no restriction of numbers has been made. As has been stated, the capacity of the winter ranges has been reinforced by the feeding of concentrates. Regardless of what the true ratio of the seasonal ranges might be under proper management, the fact remains that it has been thrown more definitely out of balance by uncontrolled use of the public domain.

In the early days of the western livestock industry, little or no hay or other winter feeds were produced. Natural forage was depended upon to carry livestock through the winter. With the settlement under the homestead laws of the higher mountain valleys, the tendency was to put into hay production all available areas. This development, together with the ever increasing use of the winter ranges by sheep, throw the total winter feed resource further out of balance with the total summer feed resource. This increased the demand for summer range on the national forests.

(2) Another factor resulting from unrestricted use of other lands and tending to increase the demand on the forests is the relative

desirability of the range. Since 1905, the forest ranges have been under management and a serious attempt has been made to limit the numbers of stock to their carrying capacities. During the same period, practically all other ranges have generally been subjected to heavier use. The result has been an ever-widening gap between the forage values of the two classes of feed.

(3) The passage of the Stock-Raising Act of 1916 has been instrumental in increasing the demand for cattle range. As has been pointed out, this act paved the way for the homesteading of the foothill ranges formerly used by cattle, which lie, in a general way, between the hay ranches and the higher ranges better adapted to sheep use. Such claims as were developed into farm units under this law were usually of the sub-marginal type. The more common practice was to prove up on these homesteads in order to sell to some out-of-the-country or out-of-the-state sheepman who needed high summer feed to supplement his desert range. Characteristic of such operations was the overstocking of these private holdings. With the loss or serious curtailment of his former range, the cattleman has often been left with insufficient available range to supplement the hay raised on his valley ranch. Consequently, his demand for high range within the national forest has increased.

(4) The competition for range between sheep and cattle complicates the distribution problem. The days of actual warfare between these two interests are past, but the competition is still keen. During the first decade of the century, when free range was still plentiful and higher ranges were going to waste on some of the forests, sheep were encouraged to come in on these high areas even if they were from distant places or from outside the state. The old sheep permits thus established are a point of attack by both local sheepmen and local cattlemen. In some sections feeling has grown up against outside sheep by reason of their reputed damage to ranges and the prevailing opinion that such cattle ranches as they acquire and convert to sheep use deteriorate greatly in value. Through the financial advantage which sheep have maintained for some years, they have been able to make an invasion of the cattlemen's former range. On the other hand, cattle have, in some instances, become established on ranges of rough topography capable of better utilization by sheep.

This competition has a bearing on the problem in that it has increased the difficulty of allotting range to the satisfaction of owners of both classes of stock.

(5) The homesteading of sub-marginal farm lands has created a demand from small, often inefficient, operators and has accentuated the conflict between large and small operators. Such homesteads were, as a rule, established under the Stock-Raising Act of 1916. They often represent sub-marginal operators, either disinclined or unable to run good stock or good bulls or to use the range carefully. Their operations may obviously work against the best good, not only of the better stockmen, but of the industry as well.

(6) Changes in farm use and farm specialization have created new aspects to the distribution problem. Coincident with the deve-

lopment of the stock industry has been a gradual maturing of the whole agricultural set-up into an age of more diversified production. Former cattle ranches may today be devoted primarily to the raising of sugar beets and run cattle as a side-line to provide an outlet for beet tops and pulp. Ex-stockmen who have entered the dairy business may desire to fatten their dry cows and heifers on the range. Then again, an orchardist may raise a little hay under his trees and desire stock to feed it to. The tendency of such men to wish to keep a finger in the stock business is better understood if it is appreciated that quite often they were originally graziers and are loathe to cut entirely free from their first love. In summation, appraisal of the relative dependency of different types of operations has grown more important with the growing diversification of the agricultural industry.

(7) The increasing demand by interests other than livestock for the use of range lands bears directly upon the distribution

problem. In varying degrees there have been demands that grazing of livestock on national forests give way to other interests or forms of use. These demands have sometimes been based upon erroneous information and in consequence have gone beyond practical needs. Adjustments have not materially affected the carrying capacity of the forest ranges, but their importance is recognized and the effect of grazing policies upon other forms of use will be given full cognizance in this study.

(8) The popular demand that distribution policies work toward the maximum financial support of the local government affects the

distribution problem. The tax crisis, brought on by distorted land values, agricultural attempts on sub-marginal lands and the years of depression, has made the public mind super-critical of any policies

which might be construed to result in weakening of the tax base. The permitting of sheep is criticized on the basis that when cattle ranches are converted to sheep use, improvements are destroyed and hay lands are converted to pasture, thereby lowering the taxable valuation. The issuance of permits to out-of-state stock is generally considered an act working against the best interests of the local communities. Since the amount of the national forest contribution to the local governments is in proportion to their net income, some local officials are in favor of increasing that income by putting fees in line with the cost of private pastures. The above cases are stated, not to argue their merits at this time, but rather to emphasize the relationship of national forests to the local communities.

(9) The mental attitude of the stockmen is an important factor of the distribution problem. Years of use of the public

domain, coupled with the individualistic nature of the work itself, have ingrained the mind of many stockmen with the idea that range is his inalienable right and that range regulations smack of meddling with that right. Policies and decisions are often protested both by individuals and by local and state associations. Stock interests have always had political strength and have not been hesitant in applying political pressure as a means of effecting changes in policies. It is all the more important, then, that Forest Service distribution policies be fair and that the local decisions resulting from them be able to face the spotlight of national publicity.

(10) Possible profit through sale of livestock or ranch property with waiver of grazing privileges often influences demand.

It is not uncommon for land owners to seek to accrue preferences through grants for the purpose of enhancing the value of ranch or range property. After a preference is established, the permittee may sell the ranch property or the livestock with a waiver of grazing privileges at a price considerably above the usual market value.

The foregoing analysis of general phases of the distribution problem presents but ten of its major factors. Needless to say, the ramifications of the problem are almost endless and are as varied as are the local conditions and combination of conditions within the region.

The local problem of dividing a limited supply of range among an over-supply of potential users is illustrated in Table 1. Approximately eight per cent of all owners of range cattle in the Yampa River drainage held permits to graze cattle on the Routt or White

TABLE 1
NUMBER OF OWNERS, NUMBER OF LIVESTOCK
AND NUMBER PERMITTED ON FORESTS BY SIZE CLASSES
YAMPA RIVER DRAINAGE
CATTLE

Size Class (2)	Number Owners		Number Range Cattle		Dairy Cattle Owned (1)
	Total (1)	With Forest Permits	Total (1)	Permitted on Forests	
1-20	732	19	5,392	152	2,820
21-50	260	39	7,244	936	964
51-100	122	50	8,477	2,838	459
101-200	81	31	11,256	3,140	228
201-300	24	14	5,796	2,305	45
301-500	16	9	5,704	3,137	38
501-1000	8	2	5,488	575	21
TOTAL	1,243	164	49,357	13,083	4,575

SHEEP

Size Class (2)	Number Owners		Number Sheep	
	Total (1)	With Forest Permits	Total (1)	Permitted on Forest
1-200	141	15	8,359	1,200
201-500	30	7	9,921	1,753
501-1000	23	8	15,885	4,750
1001-2000	43	27	60,250	20,714
2001-3000	19	11	48,085	19,725
3001-4000	9	6	29,274	17,400
4001-5000	7	4	32,266	13,740
5001-6000	4	2	22,819	9,000
6001-7000	1	1	6,589	1,750
7001-8000	3	3	23,698	14,950
8001-9000	-	-	-	-
9001-10000	1	1	9,800	5,000
Over 10000	4	4	51,744	20,700
TOTAL	285	89	318,690	138,682

(1) Based on records of county assessors--Routt, Moffat, and Rio Blanco Counties--1935.

(2) Based on total ownership of range livestock.

River Forests. "All owners" includes 732 in the 1-20 cattle size class, each of whom owns only an average of seven range cattle. Eliminating this group of small owners, approximately 28 per cent of the remaining owners held permits to graze cattle on the forests. Comparable figures for sheep show that 31 per cent of all owners held permits. Eliminating the 1-200 sheep size class, forest grazing permits were held by 51 per cent of the remainder. In 1935, 28 per cent of all range cattle and 43 per cent of all sheep in the Yampa River drainage grazed under paid forest grazing permits.

The extent to which the individuals without grazing permits are potential applicants is not known. As has been pointed out, numerous factors influence demand, and actual need for forest range may or may not be one of them. A reasonable assumption, however, is that a large proportion of owners, including many of those in the smaller sized class groups, would apply for grazing permits under a policy of unlimited distribution.

In 1935, the average number of cattle under permit on national forests in this unit was 79 head; sheep averaged 1,558 per permit.

ECONOMIC AND SOCIAL SIGNIFICANCE

Some of the effects of distribution policies upon economic and social values have been implied in the foregoing enumeration of phases of the distribution problem. The possibilities of the interrelation are infinite. Let it suffice here to mention a few of the results different policies might have upon local communities.

1. A policy of maximum distribution of the grazing privilege would lead to much smaller average permits than those mentioned. Ultimately, the average permit would be very small and bear no relation to a profitable, efficient, or satisfactory family income livestock enterprise. Such a policy would ultimately lead to dissolution of many of the large livestock operations with the attendant probable losses to individuals and financial interests.

Then, too, such a policy might tend to encourage the existence of sub-marginal operations, lying in isolated places, and thereby increase the cost of local government and foster low standards of living.

2. A policy of minimum distribution, on the other hand, might tend toward concentrating the grazing privilege into the hands of a few large operators, compel the small independent operator to sell at a loss and eventually reduce beyond practical necessity the number of home units within a community.

The importance of a carefully considered distribution policy is evident.

PRESENT BASIS FOR GRAZING PREFERENCES

At the present time, the qualifications for grazing preferences on national forests in the Rocky Mountain Region are based upon the ownership of commensurate dependent property in practically all cases. On most forests this property is further defined as ranch property producing forage crops in the amount necessary to meet the local feeding requirements. However, on the Medicine Bow Forest in Wyoming and on several forests on the Western Slope in Colorado, the ownership of desert winter ranges or spring and fall ranges, or both, has been accepted as a qualification for sheep preferences.

When the national forests were established, the initial preferences were based upon "prior use." Subsequently, qualified new applicants were admitted where surplus range was available or when surplus could be created through reductions applied to larger preferences. Through these grants and regular use of the range, preferences were established. Later, as fully stocked forest ranges became the rule, purchasers of ranch property or livestock, or both ranch property and livestock, with a "waiver of grazing privilege," were granted renewal of permits and preferences thus became established through purchase.

With very few exceptions, the national forest ranges in the Rocky Mountain Region are today fully stocked. New applicants can be admitted only through reductions applied to the larger preferences or through purchase with waiver.

ACKNOWLEDGMENTS

The information presented in this report, the conclusions drawn and the recommendations made, are not the work of the authors alone, who take pleasure in expressing their indebtedness to those who assisted in the study.

The basic information used in connection with the study of agricultural economics was collected and assembled under the direction of R. T. Burdick, Associate Economist, Department of Economics and Sociology, Colorado State College; and Marion Clawson, Associate Agricultural Economist, Bureau of Agricultural Economics, United States Department of Agriculture. The report prepared by Messrs. Burdick and Clawson is quoted in full under Caption III, "The Agricultural Situation."

F. D. Moon and T. J. Snyder, County Agents of Routt and Moffat Counties respectively, were frequently consulted concerning phases of the agricultural situation.

Milo Deming, representing the Division of Grazing, United States Department of Interior, assisted in the field collection and compilation of data related to the range situation and range users. Mr. Deming was often consulted concerning various phases of policy.

Messrs. Foster and Lindesmith of the Land Planning Division of the Resettlement Administration, contributed a vast amount of statistical data related to the use of lands.

Estimates of game population were supplied by R. P. McFarland of the Bureau of Biological Survey.

J. B. Hammon of the Soil Conservation Service, contributed an informal report of soil and erosion conditions of the Yampa River drainage.

A large number of ranchmen and livestock operators residing or operating within the study unit were interviewed. Without their excellent cooperation, it would have been impossible to have obtained much of the basic information upon which parts of this report are based.

L. J. Palmer and David F. Costello, range specialists from the Central Rocky Mountain Forest and Range Experiment Station, assisted in the collection of range carrying capacity data. The analysis of field data was made by them and that analysis is the basis for certain portions of the capacity estimates used in this study. Charles A. Connaughton, watershed specialist, contributed data on soil conditions and on the consequences of erosion.

II. DESCRIPTION OF THE UNIT UNDER STUDY

LOCATION, BOUNDARIES, AREA, WHY SELECTED

The unit chosen for study embraces an area of 4,288,261 acres or 6,700 square miles lying in the northwest corner of the State of Colorado, and includes all those parts of the Yampa and Green River drainages which are within that State. Its boundaries are: On the north, the Colorado-Wyoming State line; on the east, the Continental Divide and the Gore Range; on the south, the Yampa River-White River Divide; and on the west, the Colorado-Utah State line.

Included in the area are parts of Routt, Moffat, Rio Blanco, Grand and Garfield Counties; parts of the Routt and White River National Forests; all of Colorado Grazing District No. 6 and part of No. 1; and large areas of State lands. A variety of range types are offered, varying from the high ranges above timberline in the forests to the semi-desert winter ranges of western Moffat County. Chart No. 1 graphically illustrates present ownership and use on the basis of area.

For more detailed area data, refer to Table A in the appendix, where a compilation further subdividing present ownership and use will be found.

It has been assumed that the broad implications of the distribution problem can best be understood and the general policies governing its solution can most intelligently be formulated, by subjecting it to a detailed analysis in one representative locality. The Yampa River drainage in Colorado has been selected as such an area. Within it are represented livestock operations varying from the larger and more successful to the smaller and often sub-marginal operations. Demand for grazing privileges comes from a wide area in Colorado, Utah and Wyoming. Various types of agriculture and livestock management practices are followed. Conditions are somewhat comparable to those existing throughout much of the Western Slope of Colorado. Demand for range is intense and the need for a distribution study is outstanding.

TOPOGRAPHY, CLIMATIC CONDITIONS, SOILS

The region offers a wide range in types of topography, varying from the rough barren peaks found at the highest elevations, to the level prairies and rolling hills characteristic of Moffat County. Likewise, elevations vary from a maximum of 12,220 on Mt. Zirkle, situated on the east boundary, to a minimum of 5,000 feet where the Green River crosses the Utah-Colorado State line.

The type map included in this report offers a rough key to the topography. The barren type includes the highest elevations and some of the most rugged and rocky parts of the area. Natural mountain meadows, waste areas in coniferous timber, range in coniferous timber and grassland lie, as a rule, between elevations of 8,000 and 11,000 feet and are characterized by steep slopes and rough country. Although a small part of the aspen type goes to elevations of 10,000 feet, the bulk of it lies on the more gentle slopes between 7,000 and 8,500 feet. With the exception of a few small patches at high elevations, the mountain brush type lies on the slopes within an altitudinal range of 6,500 to 7,500 feet. The remaining types--sagebrush, shadscale, greasewood and woodland--lie mainly between elevations of 5,000 and 6,500 feet and cover a rolling terrain broken by deep arroyos. The exceptions within these types are the Green and Yampa River Canyons. These canyons, which include most of the Green River and the most westerly twenty-five miles of the Yampa River, are from 1,000 to 2,000 feet deep and are extremely rough and in many places inaccessible.

The main streams of the area in the order of their local importance are the Yampa, the Green, the Little Snake and the Elk. The latter two drain into the Yampa which, in turn, empties into the Green at the western end of the area.

Climate

Characteristic of the region as a whole are a short growing season and great extremes of temperature. As is to be expected in a mountainous country, climatic variations are great within the area itself. The average annual precipitation is 23.42 inches at Steamboat Springs and 11.36 inches at Lay. In general, precipitation, snowfall and related climatic elements are greatest at the high elevations to the east and decrease progressively to the westward. The average length of growing season, maximum temperature and minimum temperature are highest in the west section and decrease eastward.

Short growing season throughout the area and brief frost-free periods limit the possible crop production. Above 8,000 feet in elevation, timothy and wild hay are the only practical crops. Small grains in addition can be produced below that elevation. In most of Moffat County the precipitation is so limited as to make dry farming extremely hazardous or altogether impossible. Although lettuce is produced in quantity around Yampa, and about 1,500 acres are put into potatoes annually, climatic factors limit the major crops within the area as a whole to hay and small grains.

As a rule, the amount of precipitation is ample for providing water for the irrigation projects. Fluctuations in annual precipitation are important, however, on account of the influence they have upon dry-till operations and their direct bearing upon the production of forage crops on the range lands. A prolonged period of

excessive moisture is apt to result in plowing up of lands which will not prove productive in the average year and the stocking of ranges in excess of their average production. These fluctuations at two typical points are illustrated by Chart No. 2. Following the chart is a tabular analysis of climatic data.

The significant facts concerning climate, which warrant emphasis are:

1. The short growing season at the higher elevations which limits the variety of crops which can be produced.
2. The low average annual precipitation in regions of lower elevations which renders agriculture extremely hazardous.
3. The fact that at higher elevations (above 6,500 feet), precipitation from October 15 until May 31 is likely to be in the form of snow. The cumulative fall is from 100 to 220 inches. The heavy snowfall results in the long feeding season which varies from four to six months, except in the normal winter range areas.

Soils

The residual soils of the region vary greatly in accordance with the nature and areal distribution of the parent geological formations from which they have been weathered.

In the extreme eastern portion (east of Elk River and Steamboat Springs) the mountain masses are principally granite or related rocks of the older geological periods. These rocks weather slowly to form loam soils which, under existing conditions of climate and plant cover, are relatively stable and resistant to erosion processes.

Eastward from the vicinity of Lay on the south side of the Yampa River, and extending north of the river from the vicinity of Hayden, is an extensive area in which the parent rocks are principally formations of the Cretaceous period. These rocks are sedimentary sandstones and shales which weather rather rapidly to form clay and sandy clay soils, which soils, in turn, form deep deposits in the valleys and basins. By nature they are rather impervious and non-absorptive to water, but are readily removed when exposed to the corrosive action of rain wash. In consequence many of the minor drainages have deeply incised gully channels. This area furnishes considerable contribution of silt to the Yampa River.

In that great portion of the region lying westward from Hayden, and extending northward from the general line of Craig, Lay, Maybell and Sunbeam and to the Wyoming State line, the parent rocks are formations of the Tertiary period. These include easily weathered sedimentary rocks, principally sandstones and shales which form sand and sandy clay soils. Such soils are generally deeply

CLIMATIC DATA -- YAMPA RIVER DRAINAGE

Station and Elevation of Steamboat, Yampa, Springs, Columbine, Hayden, Lay, Sunbeam

	Steamboat	Yampa	Springs	Columbine	Hayden	Lay	Sunbeam
Elevation	7884	6762	8766	6337	6171	6100	
Normal Annual Precipitation (Inches)	16.04	23.42	22.90	17.45	14.08	11.36	
Per cent of Precipitation Falling in Growing Season	29.5	21.1	25.2	32.8	30.5	-	
Average Annual Snowfall (Inches)	76.6	160.1	181.2	99.2	84.1	-	
Average Annual Temperature (Degrees)	43.2	45.7	42.0	46.0			
Average Daily Maximum Temperature (Degrees)	55.1	57.7	59.0	-			
Average Daily Minimum Temperature (Degrees)	20.5	25.1	24.9	-			
Average Daily Range in Temperature (Degrees)	34.6	32.6	34.9	-			
Maximum Temperature Recorded	100	101	-	-			
Lowest Temperature Recorded	-54	-42	-47	-			
Average Date of Last Killing Frost in Spring	July 7	June 14	16	-			
Average Date of First Kill in Fall	August 26	12	6	-			
Latest Date of Killing Frost in Spring	(Year Rd.) July 3	19	-	-			
Earliest Date of Killing Frost in Autumn	(Freezing Temp.) Aug. 11	-	-	-			
Length of Average Growing Season (Days)	50	90	82	-			
Prevailing Wind Direction	SW	SW	SW	SW	SW	SW	SW

The above tabulation gives average climatic data and was compiled from the records of the Weather Bureau of the United States Department of Agriculture.

deposited over the lowlands, and under favorable climatic conditions are friable and fertile. Under the prevailing conditions of climate and plant cover, these soils are rather rapidly eroding. Many stretches of bad lands, which have apparently never reached a stable condition and support but little vegetation, are conspicuous features. From this area there is a tremendous contribution of silt to the several streams which form the drainage system, and evidence of soil movement by wind is common.

In the extreme western portion of the region, the upthrusts of Cross Mountain, Blue Mountain, Zenobia, Diamond and Cold Spring Mountain, are mountains of Carboniferous and pre-Cambrian rocks, which weather into the characteristically stable soils formed by igneous rocks.

VEGETATIVE TYPES

Cover types range from the stands of spruce and fir at the higher elevations of heavy precipitation to the semi-desert greasewood and shadscale cover of parts of Moffat County. Types are graphically described on the accompanying type map.

SETTLEMENT - PRESENT POPULATION AND DISTRIBUTION INDUSTRIALLY

Within the unit are 14,213 inhabitants of which 89 per cent are native born white, 8 per cent are foreign born white, 1 per cent are negro and 2 per cent are Mexicans. The population density is 2.1 per square mile and varies from 4.1 in Routt County to 1.0 in Moffat County. During the period from 1920 to 1930 the population of Moffat County decreased 5.2 per cent while that of Routt County increased 4.5 per cent.

Families within the unit number 3,902, and have an average size of 2.93 people.

Chart No. 3, which follows, shows the division of the population among the industries, according to the 1929 census.

The basic industries are: Agriculture, which provides employment for 42 per cent of the population; and coal mining which employs 18 per cent. The prosperity of the remaining 40 per cent is very largely dependent upon the success of the two basic industries, since oil, metal mining, etc., while important, employ comparatively few people.

NATURAL RESOURCES

The principal natural resources of the area are tillable lands, ranges, water, coal, oil, timber, game and recreational areas.

The first two items listed, tillable lands and ranges, will be discussed in detail later on in the report. A brief description of the present significance and possibilities for future development of the other resources follows:

Water is of special importance in the region because irrigation possibilities hinge upon its availability. At the present time, 48,890 acres are irrigated on 736 farms within the area. Contributing to this area are 475 separate enterprises involving 974 miles of main canals and 42 reservoirs capable of storing 21,973 acre-feet of water. Existing projects have utilized the more readily developed lands lying along the main streams.

A broad picture of the present development and future possibilities of irrigation is considered adequate for our purpose. The irrigation map with this report, showing the findings of the Engineering Department of the State of Colorado, presents just such a picture. In studying the map, however, one should keep in mind that it indicates the possible development of irrigation only as far as physical limitations are concerned and that the proposed projects have not been carefully analyzed, so far as is known, from an agricultural economic standpoint. The desirability of increasing the irrigated area has been questioned by agricultural economists. In 1929, a general economic conference in northwestern Colorado, sponsored by the Extension Service of the Colorado Agricultural College and the United States Department of Agriculture, went on record as being opposed to further irrigation development in view of existing marketing and transportation facilities, and available summer range for livestock. The authors interpret that recommendation

to refer specifically to increased irrigation for the production of crops--particularly hay. From that standpoint we are fully in agreement with the recommendation. We feel, however, that serious consideration is warranted of the possibilities of increased use of water from the standpoint of irrigated summer pasture for cattle especially, and probably for small farm flocks of sheep. Data presented elsewhere in this report indicate such use of irrigated land is profitable. It certainly appears to be an effective means of relieving over-stocked dry ranges without excessive reduction in numbers of livestock.

Coal represents a tremendous resource within this area. Geologists estimate a supply of coal underground of 122,999,800,000 tons. The enormity of the supply can be appreciated when one realizes that it would satisfy the demands of the entire United States, at the present rate of consumption, for 295 years.

The present mining is concentrated largely in the vicinity of Mt. Harris and Oak Creek, both of which are railroad points. A good percentage of the coal mined is shipped to the Denver market via the Denver and Salt Lake Railroad.

In 1931, the coal mines provided an average employment of seventy-one days to 982 men. Production the same year was 576,033 tons of coal valued at \$1,671,000. Of this amount over 91 per cent was trucked or shipped outside the area, and employment was provided thereby for an indeterminable number of additional men. Production varies greatly. For instance, the 1933 output was but 82 per cent of that of 1931; while in 1929, a peak year, the amount mined was 176 per cent of that of 1931. Then, too, a decided seasonal fluctuation in the output is occasioned by weather conditions.

These annual and seasonal variations in production are reflected by corresponding variations in the incomes of the dependent miners. As a rule the demand for labor is light in the summer and heavy in the winter.

The 1929 census shows that the coal mining industry provides employment for 18 per cent of the population of the area. Coal ranks next to agriculture in point of numbers employed in connection with the industry. The numbers employed in coal mines have not changed materially since 1929, but the total annual man-days of employment have decreased. With favorable markets the coal deposits can provide the coal miner with an adequate family income, which he has not enjoyed in recent years.

Metal mining has not progressed beyond the stage of prospecting, of which there has been more or less for the past seventy years.

Oil was first produced commercially within the Yampa River drainage in 1924. In that year two pools, Tow Creek and Moffat, were tapped and in 1927 a third pool was brought into production. These three fields produced 497,651 barrels of crude oil in 1933. An oil refinery is located at Craig.

The number of men employed in this production varies greatly. Furthermore, the oil industry employs mostly men with a certain amount of specialized training. Such men are well paid and move from one field to another. The industry, therefore, does not offer many opportunities to the unskilled laborers such as can be drawn from farms and ranches. The industry does, however, contribute materially to the welfare of local truck, building, food and special service industries.

It is said that the area offers possibilities for further development, but the real importance of the resource must remain a matter of conjecture until its exploration is completed.

Timber resources are of importance to the region. They have a twofold value: First, as a protective influence upon other resources and upon industrial developments; second, as a marketable commodity.

Of these two functions, the former is undoubtedly of the greater importance, at present. The value of forests in retarding the melting of snows and regulating run-off is well known. In regions such as this, where the bulk of the agricultural development is dependent upon an adequate and evenly distributed supply of irrigation water, its importance cannot be over-estimated. The most vital watersheds in the area are in the eastern portion within the heavy snowfall zones at higher elevations.

The bulk of these major timbered watersheds is within the Routt and White River National Forests, where it is estimated the stands contain 2,226,182,000 board feet of merchantable timber, capable of producing a sustained annual yield of 36,500,000 board feet without endangering watershed values.

Of some importance to the area is the supply of fence posts, corral poles, and fuel which the forests supply. The cutting of this class of material has not been developed as a business; rather, it is common practice for each rancher to harvest his own minor forest products. The pinon-juniper type in the western part of the area is a source of cedar posts.

At the present time, there are thirteen small sawmills operating in the area, providing not more than fifty man-years work. The development of the wood industry is hampered by the presence of more accessible stands in Colorado and neighboring states and by the competition of cheap west coast timber which is shipped into the area. Although it is impossible to foresee what might happen, it is not thought probable that the cutting and milling of timber will develop into a major industry in the near future. Eventually, however, these stands will no doubt be utilized and will provide employment for a large number of men.

Recreational areas as a resource, comprise regions which by reason of their scenic values, hunting or fishing possibilities, primitive elements, or any other natural feature or combination of natural features appeal to people as desirable places to play or vacation from their usual labors.

Many of the best of these areas are within the boundaries of the national forests. Contributing to the importance of these areas is the fact that trout fishing, always a major attraction, is most plentiful there. One primitive area, the Mt. Zirkle-Dome Peak, has been set aside at the head of the Elk River within the Routt National Forest. The Elk River region is one of the most important areas of the region from a recreational viewpoint and within it are several developed camp grounds and summer homes.

The Ladore Canyon region, which follows the Green River for most of its course within the unit, has possibilities for recreation. Its principal attractions are rugged scenery and a variety of game animals. These values have been recognized and have resulted in a movement to include the area within a national park or national monument.

All parts of the region have recreational values in varying degrees. The sagebrush prairies of Moffat County attract a large number of hunters during the sage hen season, and are potential antelope range. All of the streams and lakes at higher elevations are good trout waters. Most of the area is capable of providing hunting of one kind or another.

Present recreational use is difficult to estimate. However, the fact that four tourist camps and one hotel in Steamboat Springs are dependent upon tourists for their income gives an indication of its scope. It has been estimated that in 1935 the national forest areas within the unit were used by fifty-five summer home residents, 6,810 campers, 5,155 picnickers and 9,100 motorists; and that the primary objective of these visitors was divided among the following objectives: fishing 63 percent; hunting 9 percent; winter sports 1 percent; and miscellaneous 27 percent.

All indications are that recreational use will become more important yearly. Improved transportation facilities are making the Yampa River area more accessible to centers of population and, at the same time, public demands for outdoor amusements are increasing. It is therefore believed that commercial developments in connection with the recreational resource offer considerable possibilities for augmenting the incomes of residents, including those in the rural communities. The entire area is woefully lacking in modern facilities such as tourist hotels and cabin camps. With a transcontinental highway, which is rapidly being brought to high construction standards, traversing the area, and with favorable natural conditions for recreation, including hunting, fishing and winter sports, the commercial possibilities warrant more consideration locally.

Present land requirements for recreational use conflict very little with grazing use.

Game. The importance of game as a natural resource is receiving an ever-increasing amount of national recognition. Its economic value lies, not only in the inherent value of the animal products involved, but also in the expenditures which hunters must make for equipment, transportation, lodging and other needs incident to the harvesting of the game crop. The economic success of more than one community and region in the United States is dependent upon the income incident to hunting and fishing.

The social values to be derived from hunting and fishing are high and fill a place of growing importance in our present high-pressure industrial scheme of living. Outdoor recreations have been described by one sociologist as "the balance wheel of mechanized living." Such values are not susceptible to accurate evaluation; but their existence is generally recognized and the consensus of opinion of those concerned with the social aspects of life is that their importance has been greatly underestimated.

Considering that all of this area is well adapted to big game, the present herds are small. Mr. McFarland of the United States Biological Survey, estimates that western Moffat County supports the following big game animals: 500 elk, year round; 3,000 to 3,500 deer, of which 1,000 or 1,500 summer in the Wasatch Mountains of Utah and to a limited extent in Wyoming; 400 mountain sheep, yearlong; and 5,000 antelope, 4,500 of which move north to the Red Desert of Wyoming during the summer season. Forest Service estimates credit that part of the Routt Forest within the area with 1,200 elk and 1,000 deer; and the included part of the White River Forest with 80 elk and 200 mule deer. A liberal estimate of the game population for the entire area would be 2,000 elk, 7,000 deer, 600 antelope and 125 mountain sheep; or a density of less than $1\frac{1}{2}$ big game animals per square mile. In this area it is estimated the use of forage by all big game animals is equivalent to 31,000 cow months. This use is three per cent of the total present use by all forage-eating animals and approximately five per cent of the estimated carrying capacity.

The State has established game refuges in an effort to afford protection to big game. Within this area are the Douglas Mountain Refuge in western Moffat County and a part of the White River Refuge which includes that part of the White River National Forest within the area.

Predators are represented by mountain lions, wildcats and coyotes. Lions are very scarce in the area as a whole but are plentiful enough in western Moffat County, in the opinion of Mr. McFarland, to be the controlling factor in limiting the number of mountain sheep. Coyotes are quite prevalent but are not considered an important influence upon the numbers of big game. Wildcats are scarce and have little bearing upon big game numbers.

Beavers have been protected for years. Increases are apparent in limited areas, but on the whole the economic importance of these animals has not been fully appreciated or provided for in game management. The recent drought brought home to many stockmen the value of their water storage activities. Their number on the White River Forest section of the unit is estimated to be 10,000. Other furbearers, however, are seriously depleted and there is no indication that their numbers are increasing.

Trout represent a very important game resource from the standpoint of present use. All of the higher waters in Routt and Rio Blanco Counties are stocked; the Elk River provides trout fishing for its entire length, and the Yampa as far west as Hayden. A State fish hatchery is located at Steamboat Springs. The trout fishing inducement is the prime one for many of the tourists who visit the area during the summer season and contributes materially to the incomes of Steamboat Springs and other towns in the vicinity.

Relationship between resources and needs of population. It is difficult to state in exact terms the relation between the resources and the needs of the population. Chart No. 1 indicates the importance of agriculture and coal mining. It does not show the importance of the recreation and game resources, or the oil and timber industries. It can be said, however, that garages, hotels, transportation, trade and food industries, etc., representing over 35 per cent of the population, are dependent upon the six basic resources mentioned; with agriculture in the first place.

A possible indication of the relation between the resources and needs of the population is relief and unemployment statistics, as furnished by the Central Relief Committees of Routt and Moffat Counties, and by the National Reemployment Service.

The peak relief loads in Routt and Moffat Counties were as follows:

<u>Moffat County (March 1935)</u>		<u>Routt County (May 1935)</u>
144	Farmers	72
101	Common Laborers (Miscellaneous)	55
16	Building Trades	-
10	Miners, Coal	160
24	Domestics (Women)	29
8	Mechanics	-
15	Skilled Road Men	-
4	Supervisors	-
20	Truck Drivers	-
4	Unclassified	-
<u>346</u>	Total	<u>316</u>

The foregoing tabulation includes aged and other "unemployables," to the extent of 20 to 25 per cent.

In addition to individuals on relief rolls the following employables were seeking work:

Moffat County (March 1935)Routt County (May 1935)

54	Farmers	34
36	Laborers	28
6	Building Trades	10
15	Truck Drivers	11
10	Road Workers	16
-	Supervisors	5
-	Coal Miners	28
-	Mechanics	7
-	Cooks (Malo)	6
-	Clerks	2
-	Engineers	4
<u>121</u>	Total	<u>151</u>

The large number of Moffat County farmers and laborers on relief rolls can be traced to the hazards of dry farming in a region with an annual precipitation of 12 inches or less, as well as to attempts at farming poor land. In Routt County where climatic conditions are more favorable, the relief farmer is from poor land.

The grand total on relief and unemployed at the peak of the load was 934 adult individuals of whom 304 or 31 per cent were farmers. Another 198 or 21 per cent were coal miners.

It might be said the foregoing statistics indicate the resources of the region fall far short of meeting the needs of the indigenous population in view of the large percentage of the adult population on relief, or seeking employment. Other factors indicate instead, a lack of full use of the resources at hand. For example, the coal resource, with market adjustments, can supply unlimited employment. If full advantage were taken of the commercial possibilities of the recreation resource, including fish and game, and if furbearers were handled to the best income producing possibilities, considerable additional labor could find full or part-time employment.

Resources other than agriculture are mentioned merely to show the general relationship. A detailed consideration only of livestock problems can be undertaken in a range distribution study. Any attempt to use agricultural and range resources to improve the economic status of workers in other industries--coal miners for example--is impracticable from the standpoint of the lack of agricultural experience of these people. Furthermore, the limited range resource can never be made to meet all of the demands from livestock producers, and a complicated situation would only be aggravated by encouraging a range demand from other sources. The conclusion is that the Forest Service

distribution policy should take into consideration only the needs of the livestock producer, related agriculture and range operations.

A like sentiment is expressed with reference to agriculture and industry as a whole in the recommendations of the National Resources Board.⁽¹⁾

"While it is perhaps not within the scope of a land report to recommend the adoption of a program for the revival of industrial activity, it seems equally inappropriate to assume that such a program will not be carried out and that the unemployed must be absorbed in agriculture, a procedure involving hardships for the people concerned as well as a serious menace to established agriculture already economically unbalanced. Therefore it is recommended that no substantial movement of unemployed people from urban areas into commercial agriculture be publicly encouraged. It is imperative that the problem of industrial employment be solved in other ways than by trying to make farmers of the urban unemployed. In fact, to the extent that it is not solved, there will remain an acute problem of providing for the large and increasing surplus of farm population which should normally find employment outside of agriculture. This implies that we should alleviate the major volume of unemployment by temporary relief measures, including make-work programs, while taking proper steps to restore industry to normal functioning."

(1) Page 199 of the 1934 report of the Natural Resources Board, Part II, Report of the Land Planning Committee.

III. THE AGRICULTURAL SITUATION

Representatives of the Department of Economics and Sociology of the Colorado State College of Agriculture and of the Department of Farm Management and Costs, Bureau of Agricultural Economics, United States Department of Agriculture, gathered and analyzed detailed information pertinent to the agricultural situation in the Yampa River drainage. The results of the study were compiled into a report by R. T. Burdick, of the Colorado State College of Agriculture, and Marion Clawson, of the Bureau of Agricultural Economics. Their report in its entirety follows, with pages numbered independently.

The Forest Service in Region 2 is deeply appreciative of the contribution which these two trained economists made to the study of distribution problems in the Yampa River drainage.

ECONOMIC CONSIDERATIONS AFFECTING PERMIT DISTRIBUTION POLICY
ON PUBLIC RANGE LANDS
YAMPA RIVER DRAINAGE, COLORADO

III The Agricultural Situation - An Economic Survey

By

R. T. Burdick and Marion Clawson

Submitted to U. S. Forest Service

October 1936

Department of Economics and Sociology
Colorado Agricultural College
cooperating with
Division of Farm Management and Costs
Bureau of Agricultural Economics
United States Department of Agriculture

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Economic Considerations Affecting Permit Distribution Policy
on Public Range Lands, Yampa River Drainage, Colorado

III The Agricultural Situation - An Economic Survey

By R. T. Burdick^{1/} and Marion Clawson^{2/}

Submitted to United States Forest Service, September 1936

Nature of this Study

In 1935 the U. S. Forest Service began a study in the Yampa River drainage area of Colorado, which had as its objective the formulation of policies and regulations for the distribution of grazing permits on the Routt and White River National Forests. The need for such a study was found in the widespread demand for grazing privileges by people who had been refused permits. The Department of Economics and Sociology of the Colorado Experiment Station was asked to assist in the study, by analyzing the economic situation of the area. In 1936, the Division of Farm Management and Costs of the Bureau of Agricultural Economics, U. S. Department of Agriculture, was asked to cooperate in the economic phase of the study. The results of the economic study are given in the following pages.

Historical changes in the agriculture of the area

In order to properly understand the present economic structure of the agriculture of the Yampa River drainage area, it is necessary to review briefly the changes which have taken place since earliest settlement. Until 1866, there were only a very few cattle in the entire area, and they were kept to produce meat for nearby mining camps. Beginning in 1867 and continuing until approximately 1899, cattle were driven into northwestern Colorado each year from the South to be fattened on the good grass available, and then shipped to eastern markets. At first this method of operation was very profitable. Grass was plentiful and large numbers of cattle were brought in. Very soon, due to lack of regulation, the country was

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overgrazed and the grass was much less plentiful. Some cattle were kept over the winter, and at first this was satisfactory, but hard winters and lowered forage production combined to cause very heavy losses, and finally the abandonment of these methods.

Beginning about 1890, ranchers started to acquire land and raise hay for winter cattle feeding. Most of the range was still open for use by anyone having cattle and able to use it. Gradually, range lands were homesteaded and fenced, the best lands being taken first in each locality. Sheep were excluded from the best cattle ranges, but were found on the desert winter ranges of western Moffat County and, after the Moffat railroad was built, in the highest mountain areas of eastern Routt County. Beginning about 1916, or perhaps earlier, the better range lands passed into private ownership quite rapidly, largely as a result of the Stock-raising Act of 1916, which permitted filing on 640-acre stock raising ranches. Dry land grain production, while introduced earlier, spread rapidly during this same period, encouraged by good rainfall and high prices.

Until 1920, the Yampa River area had been predominately a range cattle area; the post-war depression forced many cattle outfits into bankruptcy and sheep replaced cattle on much of the range, both public and private. The lower numbers of cattle lessened the demand for hay for winter feeding of the breeding herd, placing the hay producer in an unfavorable position and lowering the value of hay lands. Dry years have made grain farming unfeasible in many localities, and the depression which began in 1930 has raised many problems for all types of producers.

Present economic organization of agriculture

Size and type of farms found. - Two sources of data are available to show the size and type of farms in the Yampa River drainage area, - the county assessors' records for 1935, and the census for 1930. According to the former, one-half of the farms in the area are crop farms, keeping but few livestock (Table 1):

More than half of the crop farms, or more than one fourth of all farms, had less than 50 acres of crop land. Less than 10 percent of the crop farms had as much as 90 acres of crop land. About two fifths of all farms were essentially cattle ranches, but these were also small. These ranches raised hay and grain to feed to livestock. About 10 percent of the total number of farms had sheep, and a third of these were only farm flocks. Only 31 operators had three or more bands of sheep. (See appendix, Tables 1 and 2).

Table 1.- Number of farm units of important sizes and types,
Yampa River drainage, Colorado, 1935.

Size and type of farm	Farm units		Portion of
	Number		All farm units
1. Crop farms (less than 10 cattle, few sheep)	1041		50.6
a. small - less than 50 acres crop land	602		29.3
b. moderate size 50 to 89 " " "	255		12.4
c. large size 90 or more " " "	184		8.9
2. Livestock (chiefly cattle) farms and ranches	813		39.5
a. small - less than 50 acres crop land	340		16.5
b. moderate size 50 to 89 " " "	183		8.9
c. large size 90 or more " " "	290		14.1
3. Sheep outfits (few cattle, with or with- out crop land)	204		9.9
a. farm flocks, less than 300 head	66		3.2
b. range outfits, 300 to 800 head	49		2.4
c. one and two band range outfits, 800 to 3000 head	58		2.8
d. range outfits, 3 or more bands, over 3000 head	31		1.5
Total all farms -----	2058		100.0

Based on data taken from county assessors' records, by U. S.
Forest Service.

The 1930 census reports contain data on the number of farms reporting various amounts of gross incomes in 1929. In that year, 42 percent of the farms in Routt and Moffat Counties had less than \$1000 gross income, and 74 percent of all farms were below \$2500 in gross income. However, the 26 percent of the farms each reporting \$2500 or more gross income produced more than 70 percent of the total income of the area. When it is recalled that prices of agricultural products were relatively high in 1929, it is apparent that the incomes of many farmers in this area have been very low since 1929.

These two sources of data agree in revealing that there are many small farms in this area, and only comparatively few large ones, though some of the latter are very large. On two thirds of the farms, the farmer and his family were not fully employed if we may judge from the small areas of crops grown, and the normal labor required to handle crops. Some of the operators of these small farms secured work for pay away from the farm, but the opportunities in this regard do not offer employment to all the available labor.

Crop yields.—Yields of important crops vary considerably within the Yampa River drainage area, due to variations in precipitation and in soils. In the eastern part, near Elk River, Steamboat Springs, and Yampa, yields are fairly high and consistent from year to year. On the western edge of the farming area, near Great Divide and Craig, yields average low, and vary widely from year to year. Between these two extremes, yields gradually decrease as one goes westward, although there are small areas which vary considerably from the average surrounding lands. (See appendix, Table 4).

Average yields, which must be interpreted in light of the variation which exists between localities, are fairly high (Table 2). These yields are somewhat above the 10-year average yields reported by the Bureau of Agricultural Economics, U. S. D. A., for Moffat and Routt Counties (Table 3). This difference is undoubtedly due to the fact that the farmers who were interviewed tended to report the yields they would get in a good crop year, without making sufficient allowance for crop failures, and their reported yields are therefore too high. The farmers interviewed may have been better-than-average farmers, also. It should be noted that wheat, barley, and oats yield approximately the same total weight per acre, according to each source of data. These grains are chiefly used for livestock feed, and the adaptability of a particular soil for one or the other is often the deciding factor in determining which crop to grow.

Table 2.- Normal acre yields of important crops, Yampa River drainage, Colorado.^{1/}

Crop*	Farms report- ing	Normal yield per acre	
		Unit	on irrig. on dry land land
Wild hay	18	ton	1.3
Timothy and clover hay	64	ton	2.0
Alfalfa hay - irrigated	37	ton	1.9
- dry	54	ton	1.2
Wheat - irrigated	8	cwt.	24.4
- dry	51	cwt.	12.8
Barley - irrigated	8	cwt.	19.8
- dry	25	cwt.	15.5
Oats - irrigated	16	cwt.	21.2
- dry	47	cwt.	13.1
Potatoes - irrigated	5	cwt.	77
- dry	22	cwt.	54

^{1/} As reported by farmers interviewed in 1936.

Table 3.- Average acre yields of wheat, oats, and barley on irrigated and dry land in Routt and Moffat Counties, Colorado, 1924-1933.

Crop	Unit	Routt County		Moffat County	
		Irrigated land	Dry land	Irrigated land	Dry land
Wheat	cwt.	16.7	9.7	15.4	8.0
Oats	"	14.6	8.0	12.5	6.6
Barley	"	18.1	10.6	17.6	9.3

Division of Crop and Livestock Estimates, Bureau of Agricultural Economics.

Crop Sales.- Records of crop production for 111 farms secured in 1936 show that the percentage of normal crop production sold was as follows: timothy and clover, 11.9; alfalfa, 52; wheat, 72; barley, 28.6; oats, 34.4; and potatoes, 64.3. There was considerable variation within the entire area. For example, at Baggs 87.8 percent of the barley was sold, while no barley was sold in the Yampa, Williams Fork, Fortification, Great Divide and Maybell subareas. Wheat was sold rather uniformly throughout the area studied except at Great Divide and Maybell where little was sold.

Range forage production.- The most common measure of forage production on range lands is the number of livestock fed on these lands. More stock can be run on a given area, for a short time, than the annual forage production will support; but, in the end, the number of stock is limited by the forage produced. The smaller the area of range land required to support an animal unit (mature cow or equivalent) for one month, the greater the forage produced per acre. The amount of forage produced per acre of range land varies in the same way as do crop yields, being highest in the eastern part of the area and lowest in the western part. The average range land for all ranches included in this survey was stocked with one animal unit month on 3.14 acres. This is the equivalent of .78 acre per ewe (and lamb) per month in the summer, or .52 acre per ewe (without lamb) per month in winter. (Table 5)

The average season of use of private range lands extends from April 15 to November 15, the exact date of beginning and ending varying with the location and character of the range. The eastern part of the Yampa area cannot ordinarily be used through a long season, but does have a higher carrying capacity during the proper season. Because of the relatively high precipitation, these ranges in eastern Routt County recover quickly from over-use. The range areas in western Moffat County can be used over a longer season but have a distinctly lower carrying capacity. Such ranges are more susceptible to serious injury from overgrazing, and recover slowly from such injury.

The averages shown in Table 5 are in every instance less than the number of acres per mature cow recommended by the National Forest Service for lands near the Routt and White River Forests, and by the grazing administration for lands in western Moffat County.

This indicates the need for a careful study of actual grazing use over a period of years to determine the effect upon forage.

Table 4.- Average grazing period.

Type of grazing	Sheep				Cattle			
	No. rec- ords	Date on	Date off	Av. day	No. rec- ords	Date on	Date off	Av. day
Spring range	6	4/25	6/22	58	7	4/26	6/3	38
Summer range	18	5/3	10/19	169	33	5/1	10/12	164
Fall range	5	9/25	11/10	46	2	10/17	11/18	22
Irrigated pasture	3	5/11	10/21	163	18	5/14	10/11	150
Aftermath - spring	2	4/14	5/3	24	12	5/12	6/11	30
- fall	7	10/3	11/11	39	33	10/8	11/23	46
National Forest	19	6/23	9/30	99	14	6/6	10/20	136
Public Domain	16	11/4	4/11	158	4	8/2	1/4	145
Winter feed	14	12/16	4/14	119	42	11/18	4/26	159

This analysis is confined to those records with complete data on grazing dates. Note that 18 sheep outfits had their private summer range while 19 were on the National Forest; while with cattle 33 herds used private summer range while 14 were on the National Forest.

No attempt was made to select ranches to be visited. Apparently a larger proportion of sheepmen use the National Forest, while a smaller proportion of cattlemen use the National Forest. This is in line with general opinion in the area.

Table 5.- Rate of stocking irrigated pastures, spring-summer-fall ranges, and crop land after harvest, Yampa River drainage, Colorado.

Community or location	Owned and leased:					
	Irrigated pasture		spring-summer-fall ranges		Aftermath on crop land	
	Farms report- ing	Rate of Stock- ing	Farms report- ing	Rate of Stock- ing	Farms report- ing	Rate of Stock- ing
	number	acres per a.u. month	number	acres per a.u. month	number	acres per a.u. month
Yampa	1	.24	13	2.87	8	1.01
Steamboat	13	.29	22	2.02	18	2.79
Elk River	6	.33	8	2.64	8	2.36
Craig and Hayden	5	.27	14	3.34	10	2.92
Williams Fork	2	.71	13	3.60	9	1.61
Fortification Creek			5	2.90	1	1.89
Baggs	2	.25	7	2.37	4	2.86
Maybell (Danforth Hills)	2	1.5	5	4.90	3	4.2
Great Divide			8	5.79	2	7.91
Winter public domain			3	11.43	1	
Entire area	31	.31	95	3.14	63	2.55

1/ Not included in average of all records.

The men interviewed claimed little or no "overgrazing" on their own lands. It was apparent that there were wide variations in carrying capacity on lands lying in the same community. For this reason in all the budgets prepared from these data the only grazing figure used was the average of all ranches. The variations shown in Table 5 are suggestive, but possibly not significant.

Those interested should study the forage cover map shown in the Forest Service section of this study.

Irrigated pastures have a relatively constant rate of use throughout the entire area, at about .3 acre per animal unit month, or 3-1/3 months grazing per acre for one mature cow. The amount of use of hay meadows and stubble fields varies greatly in different localities. Most of such use is in the fall after crops are harvested, but where spring range is short, hay meadows may be pastured in the spring as well. Many ranchers use hay meadows less for pasture than they might, usually because they have ample spring-fall range.

Soil Erosion.- The report on soils and soil erosion prepared by J. B. Hammen of the Soil Conservation Service, as part of the complete study of the area, indicates that some shifts should be made in the use of some crop and range lands. The effect of these shifts has not been taken into account in Tables 2 and 5, but presumably the result would be to increase yields per acre and decrease the total acreage of certain crops, through the elimination of the poorer areas.

Prevailing practices in livestock production.- Sheep and cattle are the predominant kinds of livestock found in the Yampa River drainage area. The latter are kept chiefly for beef production, though some cows are milked and the milk or cream sold. Hogs are kept on some farms, but are generally not a major enterprise. Poultry is kept chiefly to produce for home needs.

Setup of average cattle ranch in Yampa River
drainage, Colorado

(Based on 49 reports of ranches with 10 or more cows)

The normal breeding herd, on the average ranch, consisted of 153 head of cattle of all ages, of which 92 head were cows and two-year-old heifers. Of these latter, 8 head were classed as dairy cows, and were milked during the year. Of the remaining cattle 26 each were yearling heifers and steers, with 5 older steers and 4 bulls. Most calves are born during the spring, so that by winter they are weaned, and considered as yearlings. On the average, 60 head of calves were branded each year, in addition to a few that died before branding time. This is an average calf crop of 64.5 calves per 100 cows and two-year-old heifers. The total yearly death loss for all ranches was 5.2 head of all ages, or 3.4 percent of all cattle (excluding unweaned calves) on hand.

The most common sales practice, as shown by this study, was to market long yearling steers, some long yearling heifers, and fat cows. A few long two-year-old steers were sold by an occasional operator, and then not every year, such sales being confined to the lighter yearlings held over for more growth. A few calves were occasionally sold as well. The majority of these cattle were sold as feeders. The total yearly sales were 54.4 head per ranch. Sale weights per head were estimated, by the ranchers, to be as follows: cull cows, 888 pounds; fat cows, 1064 pounds; two-year-old heifers, 796 pounds; yearling heifers, 622 pounds; two-year-old steers, 809 pounds; yearling steers, 702 pounds; steer calves, 355 pounds; and heifer calves, 338 pounds.

The total weight of beef (live) sold on the average ranch was 40,500 pounds. On the basis of the cattle in the breeding herd (excluding unweaned calves), this was an average of 264 pounds per head. That is, for each head in the breeding herd (excluding unweaned calves), the average rancher sold .355 head or 264 pounds each year. This compares with 284 pounds of beef per head for North Park for the years 1929-1931, and 254 pounds reported by Vass for Wyoming in Wyo. Bul. 197. Range conditions in much of the Yampa River drainage area do not favor high calf crops. The range is rough and broken, and brushy in many places; water is often available at short distances and in numerous places. All of these conditions contribute to the separation of the breeding herd into small bunches, and the separation of cows and bulls. The ranchers interviewed estimated that the calf crop was highest from cattle running on irrigated pasture; about 7 percent lower from cattle running

on good private range; about 10 percent lower than this from cattle running on National Forests, but possibly slightly higher from cattle running on public domain. There is thus a variation of nearly 10 percent above and below the average calf crop of 65 percent, depending on the type of range used.

Beef production per head is affected by the type of range used for grazing, by calf crops, and by general management practices.

Too few cattle records were secured to justify a separate classification for each of these variables. However, there were 34 cattle records east of Craig. These ranches had 70.5 percent calf crops and cattle sales of 286 pounds per head the first of the year. There were 15 cattle ranches west of Craig. These ranches had 54.1 percent calf crops and cattle sales of 220 pounds per head the first of the year.

No cattle records were secured west of Maybell, but there are some indications that cattle sales in western Moffat County are less than 200 pounds per head the first of the year. These variations, if they continue, will have an important effect upon the possibilities of profit from cattle production in various locations within the area.

Cattle death loss was 3.8 percent for the 34 ranches, and 2.6 percent for the 15 ranches. The increase in the east being associated with the rougher range and presence of more larkspur.

Operation of Sheep Outfits

Although some farmers in the Yampa River drainage have farm flocks of sheep or feed hay in the winter, by far the greater part of the total number of sheep are run the year around on the range. These outfits vary in size from one-band outfits, possibly comprised of sheep owned by several men, to large outfits operating several bands. The larger outfits which run their sheep on the range throughout the year, use supplemental feed when necessary. Some of the smaller outfits follow this practice, but many of them feed hay to their sheep on the farm in the winter. The long winters and heavy snowfall of parts of the Yampa River drainage introduce special problems in feeding sheep. Where the snow is deep, sheep may not get sufficient exercise, resulting in dietary troubles and heavy losses when sheep are placed on the range in the spring. The wet, mucky feed corrals found on some ranches, when the snow is melting in the spring, may result in foot-rot among the sheep, unless control measures are adopted. Winter feeding of sheep is easier in the lower valleys, from Hayden west on the Yampa

River and from Slater west on the Little Snake River, than it is farther to the east where the snowfall is greater. But some ranchers have fed successfully even on the Elk River, where snow is quite deep?

Some sheep outfits raise their own ewes for replacement, others buy them. There are advantages both ways; the deciding factor often being the price that must be paid for ewes. When replacement ewes are raised, the ewe lambs saved in the fall are not bred until the next fall, resulting in a lower number of producing ewes in the flock. These ewe lambs do gain in weight during the year, however. Buying replacement ewes results in a somewhat higher cost per head, but also in a higher gross income per head. Some outfits keep old ewes in the flock until they die, others sell some each year. The latter method results in some income from these old ewes, but necessitates higher costs for replacement ewes.

Table 6.- Comparison of results from different methods of handling sheep, Yampa area, Colorado.

Item	Unit	Range flocks		
		Winter feeding	Winter grazing	Farm flock
Number records	No.	11	17	13
Average number sheep	No.	1331	6094	134
Percent lamb crop	Pct.	92	82	104
Sales per head first of year	Lb.	60	52	72
Wool clip per head	Lb.	7.9	9.2	8.2
Percent lambs sold as fat	Pct.	83	84	99
Percent lambs sold as feeder	Pct.	17	16	1
Average sale weight fat lambs	Lb.	80	78	80
Average sale weight feeder lambs	Lb.	66	66	35
Amount feed per head:				
Hay	Lb.	425	23	585
Grain	Lb.	9	2	2
Cottonseed cake	Lb.	2	9	1

Table 6 summarizes the results reported for three methods of handling sheep, i.e., winter feeding, winter grazing on the public domain, and small farm flocks.

If these 41 sheep records are divided into those with their headquarters east or west of Craig, the number west is too few to justify too much emphasis upon the differences, but the nine "western" records do show lower lamb crops, less pounds of sales per head of sheep, and greater death loss. This is in agreement with local opinion and reflects the sparse vegetation and overgrazing which are prevalent as one goes farther west in the areas.

The data in Table 6 will be used later in this report in preparing sheep budgets.

Farm tax delinquency.- Part of the present economic situation of agriculture in the Yampa River area is shown by the record of tax delinquency. Tax delinquency in Moffat County was quite high prior to the depression and naturally increased from 1930 to 1932 (Table 7). Data are lacking for Routt County, but delinquency is known to be lower than in Moffat County. Tax delinquency in 1928 cannot be attributed to either drouth or depression, but was due primarily to tax charges on lands in excess of their ability to pay. Considerable areas of range land had been broken up for crop land. The small size of these new farms, and a lack of capital to equip them, resulted in their being unable to produce enough to earn the operator a reasonable return for his labor or to pay taxes.

One immediate result of this widespread tax delinquency has been a tremendous increase in the acreage of land held by the county, or for which the county might secure a tax deed. Some of this land has been sold to stockmen for range, and some to others for farm land, but recently there has been a tendency for the county to hold such land and lease it for range. The existence of such widespread delinquency prior to the depression is ample evidence of mistakes that have been made in land settlement and of the need of far-reaching changes in the agriculture of the area, and in the methods of assessing land. Assessment of land as grazing land, and payment of taxes on that basis, contribute more to county revenues than assessment as crop land and widespread tax delinquency.

Table 7.- Tax delinquency in Moffat County, Colorado, 1928 to 1932.

Year taxes were levied	Area of agricultural land delinquent for taxes		Assessed valuation of real estate (land and bldgs.)	
	Acres	Percent of total	Amount delinquent	Percent of total
1928	457,937	48.7	1,922,887	47.1
1929	485,208	50.5	1,986,604	49.2
1930	512,464	52.2	2,129,935	54.2
1931	720,948	72.1	2,320,165	74.0
1932	761,087	75.0	2,195,570	72.7

Source: Preliminary report on Farm Tax Delinquency in Colorado, 1928 to 1933, by G. S. Klemmedson. Colorado Agricultural Experiment Station and Bureau of Agricultural Economics, U.S.D.A.

Comparison of Returns from Cattle and Sheep Range Production

Some of the range land of the Yampa River drainage area is better suited for use by sheep than by cattle. The desert winter range area, for example, is used almost exclusively by sheep, since water is available only in the form of snow in winter, under which condition sheep fare better than cattle. The type of forage found, such as weeds and brush, is also better suited to sheep. This winter range is overgrazed under present rainfall and forage conditions. There is general agreement on the necessity for a 50 percent cut in the number of sheep on this type of grazing. Some of the high summer range, because of its broken topography and the presence of brush, poisonous plants and flies, is better adapted to sheep than cattle. Sheep can be herded to utilize rough or brush areas much more successfully than can cattle. Larkspur, the most common poison affecting cattle, is seldom the cause of death less of sheep, nor are they affected by flies to the same degree as are cattle. There are some mountain grassy parks where cattle may utilize forage better than sheep. The real determining factor for most of the range is the relative return from cattle or sheep.

What have been the returns from range cattle and sheep production during the past 25 years? It must be recognized that conditions have changed during that period. Twenty years or more ago much of the range outside the National Forest was in much better condition than today. This is particularly true of the winter range. The winter feeding of cottonseed cake or other supplements has increased during this period. Accurate data on the changes in costs and returns, during the past 25 years, are lacking, but prices are available.

Table 8 has been prepared to show the possibilities of gross income from cattle and sheep. As shown earlier the average beef production was 264 pounds per head. The average sheep production was 53 pounds plus 8.6 pounds of wool. To make direct comparison easier each has been adjusted to an animal unit, which may be defined as the equivalent of a mature cow. The number of cattle the first of the year times 0.83 gives animal units, and the number of sheep times 0.2 gives animal units. This results in 318 pounds of beef per animal unit, compared to 265 pounds of mutton plus 43 pounds of wool.

Column 4 in Table 8 shows the gross value per animal unit of cattle for the 25 years, 1910 to 1934, based upon Colorado September 15 prices. Column 7 shows a similar calculation for sheep. Column 8 shows the sheep gross income as a percentage of the cattle gross income. In the years 1910 to 1914 sheep gross income was 122 percent of the cattle gross. For the entire 25 years it was 166 percent.

The above comparisons have all been on the basis of gross returns from cattle and sheep, with no allowance for the costs of operation. From the budgets presented later it can be calculated that the expenses of operation (not including interest), per animal unit, for sheep and for cattle are between \$14 and \$15 per animal unit. These costs are all estimated but are in close agreement with actual ranch records.

If cattle prices were 6¢ per pound, the 318 pounds average production per animal unit would bring in \$19.08. In order for the 265 pounds of mutton and 43 pounds of wool per animal unit of sheep to bring a gross total of \$19.08 average lamb and sheep prices could be 5¢ per pound and wool prices 13 $\frac{1}{2}$ ¢ per pound.

If sheep prices were 8¢ and wool 22¢ (as used in the budgets discussed later in this report) the gross income from an animal unit of sheep would be \$30.66. The 318 pounds of cattle would require an average sale price of approximately \$9.65 to bring \$30.66.

The number of times that cattle sell for \$9.65 per hundredweight on the range when sheep bring \$8.00, or cattle bring \$6.00 when sheep sell for \$5.00 are few in recorded history. These comparisons explain the shift from cattle to sheep which has been taking place in the area.

Table 8.- Comparative gross income per animal unit, cattle and sheep, with Yampa River production and Colorado September 15 prices paid to farmers.

Period	Prices secured			Gross income per animal unit from -				
	Beef cattle per 100 lbs (Av. price all classes Colo. Sept. 15)	Sheep, all ages, per 100 lbs. 1/ annual price (Av. price Colo. Sept. 15)	Wool per lb. (Weighted av. 264 lbs. or taken as = 95% U.S. price)	Cattle 1 head = 264 lbs. or 318 lbs. beef per a.u. 1 head = .83 a.u.	Sheep 1 head = 53 lbs. mutton & 8.6 lbs. wool or 265 lbs. mutton & 43 lbs. 1 head = 1 a.u. Mutton: Wool: Total Sheep:			Total sheep as a percent of cattle
Column	1	2	3	4	5	6	7	8
1910-1934	\$6.54	\$ 8.61	27.24	\$20.80	\$22.82	\$11.70	\$34.52	166
(17) 1910-1914 Pre war	5.56	5.40	17	17.68	14.31	7.31	21.62	122
1915-1919 War	7.96	11.49	39.6	25.31	30.45	17.03	47.48	188
1920-1924 Post war	6.14	9.34	30.9	19.52	24.75	13.29	38.04	195
1925-1929 Prosperity	8.10	11.61	32.3	25.76	30.77	13.89	44.66	173
1930-1934 Depression	4.92	5.19	16.1	15.64	13.75	6.92	20.67	132

1/ Calculated from the lamb prices by assuming one eighth of total sales as old ewes at a price one half of lamb price.

To partly offset this advantage, cattlemen can use irrigated pasture. The number of records secured were too few to justify absolute confidence in the results, but these records indicated that beef production per head on irrigated pasture was 20 percent better than the average for all records. This increase will put cattle on an equal basis with sheep, i.e., each can sell for approximately the same price per hundredweight, as long as wool prices keep their relative level. (This ignores the fact that sheepmen can also increase their production above the average of 53 pounds per head.)

Winter Feed vs. Public Domain for Sheep

There are wide differences of opinion in this area as to the results from winter feeding of sheep. The data summarized in Table 6 show some of the differences in lamb crop, weight of lambs, and amounts of feed as shown from this study.

Budgets shown in some detail in Table 5 in the Appendix illustrate the possibilities from handling sheep by each method. The one-band budgets for winter feeding result in \$991 more return for use of investment as compared to the one-band budget on the public domain. This exact figure may not be significant as it is due to the sale prices and expense rates used uniformly on all budgets. But the fact that winter hay feeding, on the basis of the information given by men who have fed sheep in the winter, is more profitable than winter grazing is highly significant.

It shows that one solution for the present overgrazed winter range is to feed hay on private lands. Many sheepmen will find it necessary to learn how to feed. The fact that others have learned, should be a challenge to those who doubt. The opportunity to increase income by so doing should be a further inducement to try feeding.

Value of Different Types of Range

The problem of land values is important. It affects the community in many ways. This study resulted in data that can be of some assistance in estimating land values.

Table 9 has been prepared based upon the average results from all cattle and sheep records secured. It uses the average pounds of production per animal unit as discussed in Table 8, and the average acres of various kinds of range land required per animal unit per month as shown in Table 5. The prices used are the same as in the budgets, which will be discussed on following pages.

Table 9.- Land values based on average results all records,
Yampa River area.

	Line	Cattle	Sheep
Average weight sales per animal unit livestock -----	1	318 lbs.	265 lbs.
" " wool -----	2		43 lbs.
Assumed prices, livestock, cwt.-----	3	\$6.75	\$8.00
" " wool, lb.-----	4		.22
Value per animal unit-----	5	\$21.46	\$30.66
Ranch expense other than interest (including operator's labor) per animal unit-----	6	14.00	14.00
Difference per animal unit-----	7	7.46	16.66
5 percent on value per animal unit (\$50)-----	8	2.50	2.50
Net available to pay for use of land--	9	4.96	14.16
Net per month-----	10	.41	1.16
Average amount range land to carry animal unit 1 month (Table 5)-----	11	3.14	3.14
Earnings per acre of range (line 10 divided by line 11)-----	12	.130	.37
Equivalent land value (capitalizing at 5%)-----	13	2.60	7.40
Average amount irrigated pasture to carry animal unit 1 month (Table 5)-----	14	.31	.31
Earnings per acre irrigated pasture (line 10 divided by 14)-----	15	1.32	3.74
Equivalent land value (capitalizing at 5%)-----	16	\$26.40	\$74.80
Acres public domain to carry animal unit 1 month (Table 5)-----	17	11.43	11.43
Earnings per acre-----	18	.036	.101
Equivalent land value capitalized at 5% 19	19	.72	2.02
Five months earnings (the average time that animals used feed or aftermath)-----	20	\$2.05	\$5.80
Equivalent value 1 acre irr. crop land	21	\$41.00	\$116.00
Dryland (one third)-----	22	\$13.66	\$38.66
Seven months earnings-----	23	\$2.87	\$8.12
Equivalent value, 1 acre-----	24	\$57.40	\$162.40
Dryland (one third)-----	25	\$19.13	\$54.13
Earnings per animal unit (line 9)-----	26	\$4.96	\$14.16
Equivalent earnings per head-----	27	\$4.12	\$2.83
Equivalent earnings per head per month	28	.34	.23

Line 5, Table 9, shows that the gross income per animal unit will be \$21.46 for cattle and \$30.66 for sheep. Line 6 assumes a uniform charge of \$14 per animal unit for all ranch costs other than interest on investment. Line 8 assumes a uniform charge of 5 percent on \$50 per animal unit valuation of livestock. (This would be the equivalent of \$50 per cow in the breeding herd and \$10 per ewe in the flock.)

Line 9 shows \$4.96 per animal unit of cattle and \$14.16 per animal unit of sheep as available to pay for the use of investment in real estate and improvements. Line 10 shows this as net (earnings) per month.

From this point on calculations have been made to show the value of various kinds of land. In all cases a 5 percent rate was used in estimating valuations. Also it should be emphasized that the resulting valuation is for real estate, per acre, including all improvements.

For example, cattle earn 5 percent on \$2.60 grazing land (line 13) while sheep can support a \$7.40 valuation for similar lands.

In the case of irrigated pasture (line 16) cattle can support a \$26.40 valuation and sheep a \$74.80 valuation.

In the case of public domain used for winter grazing (line 19) cattle can support a valuation of 72 cents per acre, sheep \$2.02.

In lines 20 to 22 it was assumed that one acre of irrigated hay and crop land would furnish hay, grain and aftermath grazing for 5 months per animal unit. Under these conditions cattle could support \$41 hay land and sheep \$116. Assessed valuations in the area were approximately one third as high for dry crop land as for irrigated. Line 22 indicates \$13.66 and \$38.66 as the respective dry land values which are one third of the irrigated rates.

Lines 23 to 25 are similarly prepared on the basis of 7 months furnished by one acre.

The earnings per month (line 10) are on the basis of animal units. Reducing this to a head basis would result in cattle earning 34 cents per head of all cattle on hand the first of the year, and sheep earning 23 cents per head on hand the first of the year (line 28). In other words, one sheep earned two-thirds as much as one head of cattle under the price and production rates used in this analysis.

The earnings per acre (lines 12, 15 and 18) are significant as an indication of the rent per acre which might be paid for such lands. For example, cattle earn 13 cents per acre on range land (line 12). This of course is upon the assumption that cattle prices are \$6.75 per hundredweight and that 3.14 acres of grazing are required per mature cow (animal unit) per month. If the calf crop, sale weights, death loss, sale prices, or production of forage differed from these averages, the net earnings per acre would obviously change.

For example, if all other conditions remain unchanged and cattle prices are \$6.00 per hundredweight rather than \$6.75, then the 13-cent earnings per acre drop to 6.7 cents per acre, or 21 cents per month. This is practically the National Forest base fee for present grazing, and would seem to be close to actual values. However, there is one further point to consider. In the budgets which will be discussed later, all grazing lands were allowed a uniform tax of 8 cents per acre. This tax is included in the \$14 per animal unit ranch expense (line 6, Table 9). Consequently, all range land earnings are above the 8-cent tax charge. The 13 cents would be 21 cents per acre before deducting the tax. The 6.7 cents would be 14.7 cents before deducting the tax. Taxes go on irrespective of market fluctuations in cattle prices. It would seem desirable to either reduce real estate tax rates, and replace them by an income tax or frankly tie assessments on real estate to earnings, if the community is to avoid a tax situation where it is possible for taxes to absorb 8/14.7 of the income (i.e., 54 percent in this case), and with lower cattle prices (below \$6.00 per cwt.) actually take all of the earnings.

The calculations in Table 9 are offered as a suggestion as one way to estimate earnings per acre, and amounts which can be paid per acre for different kinds of land. The individual, by substituting his own experience as to production, prices, acres per mature cow, etc., can calculate the amounts which he can pay for grazing land. 1/

Earnings as a Basis for Grazing Fees

They also indicate that under average conditions present National Forest cattle fees are very close to their actual value. Sheep fees are far below their ability to pay. For example, the 37 cents per acre (line 12) indicates that sheepmen with 8 cent lambs, can pay three times as much per acre for grazing land, when compared to cattle at \$6.75 per

1/ See Appendix for a blank form to be used in calculating individual production in relation to land value.

hundredweight. If sheep average prices drop to 7 cents this 37-cents would drop to 30 cents, and at 6 cents for lambs it would be 16½ cents per acre of grazing. All of these are earnings above the flat tax charge of 8 cents per acre, the same as for the cattle calculations.

The comparable fees per head of sheep per month would be (line 10, \$116 divided by 5), 23 cents for the 8 cent lambs, 18.9 cents for 7 cent lambs, 10 cents for 6 cent lambs, and 4 cents for 5 cent lambs.

The base fees for sheep in the Routt National Forest is 5½ cents per head per month. This fee might be raised to 12 or 15 cents per head in order to place it on a comparable basis with the 21 cent cattle base fee.

The calculations in Table 9 are on the year basis. In other words earnings per animal unit of cattle or sheep are assumed to be uniformly distributed throughout the 12-month period. Consequently, fees for winter grazing can be on the same basis of rate per head per month as the fees for National Forest summer grazing.

Line 18 indicates that if 11.43 acres of public domain winter grazing were used per animal unit per month (equivalent to approximately 2 acres per head of sheep) then these public domain lands earned 3.6 cents per acre from cattle and 10.1 cents per acre from sheep. (This is above the arbitrary charge of 8 cents per acre tax.) Since no tax is paid on public domain, but merely included here for convenience of comparison, the correct earnings on public domain would be 11.6 cents per acre for cattle and 18.1 cents for sheep.

This again assumes the use of the average conditions found on all ranches. Actually the production of beef is seldom feasible on public domain, due to lack of water and absence of proper vegetation. Also the production of sheep on the public domain is below the average for all ranches studied, so that the public domain cannot show earnings per acre or per head which are as high as the average used, Table 9. The budgets in the following pages will make allowance for these conditions.

Budgets for Typical Farms

In order to compare farms of different types, under the same conditions of prices, costs, and yields, farm budgets were set up for 29 possible farms. A farm budget is simply a plan for the operation of the farm, based on past experience as a guide to future production. All farm budgets were made with average crop yields per acre, although it was

realized that some farms in each group secure high yields, and others low. Likewise, in other respects, some farms and some farmers are better than average, and others worse.. (See Table 6 in Appendix for data used in preparing the budgets.)

Livestock prices.- In the preparation of these budgets it was necessary to select some price as a basis of comparison. Prices paid to farmers in Colorado for livestock are available by months since 1910. The average of all years, 1910 to 1934 inclusive, for the month of September was used as a base. This period was favorable to sheep. In order to reduce this price advantage, the 25-year average price for all sheep and lambs (\$8.61 from Table 8) was reduced to \$8.00 in making the budgets. The 25-year average price for all beef cattle (\$6.54) was increased to \$6.75.

Some of the more important data used in arriving at the final answer - the amount of money the farm earned above expenses - are found in the Appendix, Table 5, and a summary of this information is in Table 10. The first five farms each had 40 acres of crop land; one farm kept dairy cattle, milking 20 cows and selling cream or milk; two others raised grain, one on irrigated land and one on dry land; while the other two raised potatoes as well as grain, on irrigated and dry land. Some farmers have done well with potatoes. The Yampa River area produces some potatoes for seed for winter potato areas in Texas, and some for home consumption. In most places where soil and other conditions are favorable, frost is a bad hazard. Potato production is rather risky, and can be carried on successfully only by a few farms, with specially favorable locations.

Only two of the six 40-acre farms were able to pay the operator \$50 a month for his wages. The 40-acre dry land grain farm did the poorest of all, returning only \$183 as wages for the farm operator (line 4). There are many 40-acre dry land farms in the Yampa River area, and many of them are located where yields are below average. Such farms offer little opportunity even in years of good rainfall and good prices. Forty-acre farms producing irrigated grain, dry land potatoes, and dry land grain, failed to earn going wages for the operator. Farms which cannot earn wages for the operator have no surplus with which to pay interest or debts. No matter how low the land is valued, such a farm cannot pay interest on that amount, unless the operator is willing to work for less than going wages, and to sacrifice his family for the privilege of owning such a farm. These 40-acre farms, while not paying wages in crop production, were valuable range lands before they were broken up.

Table 10.- Summary comparison of budgets for farms of various sizes and types based on long time averages secured from 1936 study of Yampa River area, Colorado.1/

Type of Farm (Acroage of crops only)	Line	Receipts	Operator's Labor Value	Net available for re- turn on invest- ment	Net returns on real estate	Estimating Land Values, oapita- lizing at 5 percent		
						Irrigated Land	Dry Crop Land	Grazing spring- summer-fall
Column	1	2	3	4	5	6	7	8
1. a) Irrigated grain, 40 acres	1	\$ 494	\$ 494					
b) Irrigated potatoes, 40 acres	2	695	600	93	68	29	10	\$ 2.58
c) Irrigated dairy, 40 acres, 25 head	3	1,317	600	417	325	69	23	6.17
2. a) Dry grain, 40 acres	4	183	183					
b) Dry potatoes, 40 acres	5	379	379					
3. a) Irrigated grain, 80 acres	6	1,029	600	429	394	86	29	7.66
b) Irrigated hay, 80 acres	7	524	524					
c) Irrigated potatoes, 80 acres	8	1,545	600	945	870	191	64	17
4. a) Dry grain, 80 acres	9	479	479					
b) Dry hay, 80 acres	10	213	213					
c) Dry potatoes, 80 acres	11	904	600	304	269		48	12.64
5. a) Small beef, 80 acres, 56 head 2/	12	635	600	35				
b) Small sheep, 80 acres, 474 head 2/	13	2,276	600	1,676	1,428	98	53	
6. a) Dry grain, 200 acres	14	1,151	600	551	451		35	9.20
b) Irrigated hay, 200 acres	15	1,252	600	652	562	51	17	4.52
7. a) Cattle, 356 acres, 300 head	16	2,159	600	1,559	659	16	5	1.44
b) Cattle, 582 acres, 500 head	17	3,749	600	3,149	1,699	28	9	2.45
8. a) Sheep fed, 95 acres, 615 head	18	2,768	600	2,168	1,868	96	32	8.49
b) " " 167 acres, 1230 head	19	5,384	900	4,484	3,884	102	34	9.97
c) Sheep, range, 615 head	20	2,078	600	1,478	1,203			7.38
d) " " 1230 head	21	4,393	900	3,493	2,943			9.04
e) Sheep, range & owned, 1230 head	22	3,646	900	2,746	2,196			2.39
f) Sheep, range, 4920 head	23	16,672	1,800	14,872	12,672			9.75
9. a) Sheep, fed, 80% lamb crop	24	4,533	900	3,633	3,033	81	27	7.21
b) " " 70% " "	25	3,802	900	2,902	2,302	62	21	5.48
c) " " 60% " "	26	3,057	900	2,157	1,557	42	14	3.70
10. a) Cattle, fed, 70% calf crop	27	2,327	600	1,727	827	20	7	1.81
b) " " 60% " "	28	1,825	600	1,225	325	8	3	.72
c) " " 50% " "	29	1,173	600	573				

1/ See Table 5 in Appendix for more detail concerning these budgets. 2/ Cattle on grazing, sheep on irr. pasture.

While the average 40-acre farm cannot return wages to its operator, there are exceptions. The irrigated farms growing potatoes and keeping dairy cattle are illustrations of this. Where good irrigated hay land and irrigated pastures or high quality range is available, dairy herds producing milk for sale will do very well. The operator of such a farm must work a good deal more and harder throughout the year than the operator of a 40-acre dry land grain farm. One farmer from whom a record was secured made a good living, sufficient to send the boys to college, from 35 acres of dry land grain and potatoes. An exceptionally favorable location was responsible for potato yields more than twice average, and potatoes provided the major part of the income. Only in special circumstances can the farm with 40 acres of crop land make an adequate living for a family.

Six farm budgets were prepared for farms with 80 acres of crop land (lines 6 to 11 inclusive). Three of these earned more than the operator's wages. Dry land potato production, irrigated potato production, and irrigated grain production produced much larger incomes per farm than irrigated hay production. The latter type showed up the worst. As with the smaller farms, it was only the exceptional 80-acre crop farm that earned returns above wages. The statements made above about potato production apply here also. Irrigated grain production is carried on only on well drained soils, and the yields reported are those which can be secured only from the best grain lands. Irrigated hay and dry land grain production on 80 acres of crop land, two rather common types of farms, earned the operator less than \$50 per month, with no allowance for any interest for the land or equipment used. Such farms operated in this way have little value, though of course they can be combined into larger units.

In Table 1 it was shown that over 40 percent of all the farms in the Yampa River drainage area were crop farms with less than 90 acres crop land. These budgets indicate very clearly that with average prices it is only the exceptional farm of this type which can earn the operator \$50 a month, even with no allowance for interest on land or equipment. This conclusion squares with common knowledge, based on observation. One sheepman said he saved the lives of 32 dry farmers by buying their places during the recent drouth. One dry land grain farm of this type, in Great Divide, had had no threshing bill for five years, for the simple reason that he had not raised enough grain to thresh.

Two budgets are given for farms with 80 acres of crop land, producing hay and grain and feeding it all to cattle or to sheep (lines 12 and 13). This acreage of land is

sufficient to provide winter feed for 56^{1/2} cattle or 474 sheep. The strictly beef cattle outfit of this size just paid the operator's wages, with only \$35 allowance for interest on investment (line 12). A farm flock of sheep, running on irrigated pasture in summer and being fed hay in winter, can be made to earn a very satisfactory return (line 13). Few farmers keep a farm flock as large as 464 head, but many keep smaller flocks of 200 or 300 head. Considerable variation was found among the farm flocks studied - some did very well, but some did poorly. It seems logical that farm flocks, running on irrigated pastures, should produce better than range flocks, but in fact the production was about the same.

Budgets are also presented (lines 14 and 15) for 300 and 500-head cattle outfits, running cattle on range in summer and feeding in winter. Such outfits require the full time of two men throughout the year, and additional help as well. Cattle outfits of this size can pay all expenses, pay the operator \$50 a month, and still have something left to pay interest on land and other investment. However, the acreage of land required is comparatively large, so that the value per acre is low - \$16 to \$26 per acre for irrigated crop land, and approximately \$1 to \$2 per acre for range land. This represents a fair average of what good cattle outfits can do. 2/

Budgets were also worked out for six sheep outfits, two with 615 sheep, three with 1230 sheep, and one with 4920 sheep. Each of these outfits was more than able to pay the operator full wages. The outfits which fed secured a somewhat larger net return than did the outfits running on the range in winter. However, they owned a much larger area of land, particularly crop land, so that the amount of investment per acre of grazing land which could be supported was about the same.

Budget 8-e was for 1230 sheep run on privately owned winter range. The value of \$2.39 per acre was for all range, both summer and winter. Actually the sheep were on spring,

1/If 1.4 ton of hay per head of cattle is used in place of the 2 T. used in all budgets, then 80 cattle can be kept and the net income will be increased approximately \$400.

2/If cattle are fed 1.4 T. in place of 2 T. hay per head, the net income would be increased approximately \$350 for the 300 head, and \$590 for the 500 head outfit. Less acreage would be required for the ranch.

summer and fall range for 7 months, and on winter range 5 months. If the net earnings (\$2196) are divided in this ratio and set against the acreage of each, it would result in a valuation of \$3.86 on summer range, and \$1.56 per acre on winter range.

Some economies of operation can be made by larger outfits, in the use of labor. These are most marked as the outfit increased from a one-half-band unit to a one-band unit, but are still in evidence until a two-band unit is operated. Further increases in size bring much smaller proportional increases in efficiency, and at the same time bring increased risks. The owner can keep a one-band outfit under close personal supervision, a two-band outfit less so, and a four-band outfit less. Unless the operator is able to pick and retain competent, trustworthy men, he is running a risk of having losses correspondingly larger.

Not only do the larger outfits return the operator full wages and leave a sum to pay interest on land, but they hire considerable amounts of labor, most of which is local. The larger outfits, particularly the sheep outfits, because they earn more money, are able to pay more for grazing land than the small man can afford to pay.

Budgets 9-a, b and c, are for a one-band sheep outfit, winter fed, and with 80, 70 and 60 percent lamb crops, this being the only change between the three budgets, introduced to show its effect upon land value. The 60 percent lamb crop can support land values approximately one half those for an 80 percent lamb crop.

Budgets 10-a, b and c, are for 296 head of cattle with 70, 60 and 50 percent calf crops. The 50 percent calf crop could not support any land values.

All the farm and ranch budgets were calculated on the basis of ownership of all spring-summer-fall range used. Many ranches have Forest permits and a few operate on public domain. Forest permit grazing fees are lower than the cost of running cattle or sheep on owned land. Frequently land can be leased at a lower cost than its ownership entails, if allowance is made for interest on the money invested in land. The rancher, who runs cattle or sheep on National Forests or leased ranges at a lower cost than his neighbor who owns his range, has a larger net income which can be used for family living expenses or for payment of interest and debts. If half of the necessary range land is owned, this greater income can be used to pay interest on a much higher value per acre, since fewer acres are involved than when all the range is owned. Thus, a rancher who owns only half of his range, and runs on the Forest with the rest of his stock, can afford to pay considerably more for his range than can the rancher who must own all his range.

Columns 6, 7 and 8, Table 10, show the value per acre for irrigated land, dry crop land, and private grazing lands upon which 5 percent can be earned with the budget as shown.

These values were secured as follows: The assessed valuations in the area were approximately one third as high for dry crop land as for irrigated crop land. In estimating taxes, values of \$30 per acre irrigated, and \$10 per acre dry were used. Private range land was valued at \$2.66 per acre.

Budget 3-a, for example, has \$394 available to pay return on land investment. This budget has 80 acres irrigated land, 9 acres farmstead valued as dry land, and 91 acres of grazing, or a total of 180 acres. Each of these areas were multiplied by the corresponding assessed value, i.e., 80×30 ; 9×10 ; and 91×2.66 , giving a total of \$2,732. The \$394 is 5 percent of \$7,880 which is 288 percent of the assessed values. Each of these values was increased, (i.e., 30×288 ; 10×288 ; and 2.66×288), resulting in land values of \$86 per acre for irrigated land, \$29 for dry land, and \$7.65 for grazing. This method differs from that discussed in connection with Table 9, and is offered as another method by which one may estimate land values.

How satisfactory are farm incomes?

The budgets given in Table 10 show what farm incomes may reasonably be expected from farms of different sizes and types. Some farmers can do better than this, but at least as many will not do as well. Are these incomes sufficient for a satisfactory standard of living, and should we be satisfied with them? The answer to this question is largely a matter of what we consider a "satisfactory standard of living." The man who has a ranch which produces enough to give the family \$2,000 a year for living expenses in addition to a home to live in and farm produce to eat, probably thinks that a cash income for family living of \$400 or less would be inadequate. But some farmers have lived for many years on small farms which have not averaged over \$400 a year, available for family living. These farmers could not afford an auto in most cases, or many other things that seem desirable. Yet the fact that they have continued to live on such farms indicates that these farm incomes were moderately satisfactory, at least to these particular farmers or those who could find nothing better to do.

In considering the adequacy of a given income, recognition must be given to the possible income for these same people under other conditions. Prior to 1930, opportunity

for employment was generally available in towns and cities; since 1930, these opportunities have been much less common. Small farms, which cannot produce more than \$400 net income over a series of years, may provide a better opportunity than can any other location or industry for that farmer.

The authors hesitate to say that certain farm incomes are unsatisfactory, but everyone is interested in having as large an income as possible. With the going rate of wages for farm labor equal to about \$50 a month without board, it seems that farms which produce less than this are definitely too small. Some farms which produce more, in order to enable the operator to pay interest for the land on the same basis as a larger rancher might, will have little left for the family living. In the last analysis, the satisfactoriness of a given farm income must be judged by the family which receives it. We can point out about how large that income will be over a series of years, and how dependable. Society as a whole, or the government, may assist people to get larger incomes, but it cannot set up a fixed amount below which incomes are too low to be adequate.

Economic Problems of the Yampa River Area

This section of Colorado has been handicapped in the past by slow and costly transportation. There have been marked improvements in transportation in recent years.

For several years it was badly crippled by the failure of banks in this area. New banks and new credit agencies have been a big help. Better livestock prices have helped restore credit. The trend toward more sheep, more milk, more cash crops such as potato and alfalfa seed have increased the community income and improved the credit standing of the farmers.

Adjustments are slow. There are far too many farms of a size which makes it practically impossible to earn a comfortable living. There are too many sheep grazed on the winter range, and a general tendency to overgraze all classes of lands due to the shortage of rainfall in recent years.

Tax charges on grazing land and on some recently plowed and untried "dry crop lands" are out of line with the productive capacity of these lands. The community should give careful attention to its tax problem and work out a more equitable distribution of the tax load.

Lease rates for private range are very close to the long-time value of such lands (20 to 25 cents per acre is a common rate for the better range land) but fees for public lands, either forest or public domain, need adjustment to bring them in line with costs for the use of other lands.

Social problems.— The most apparent need is for increased incomes, to permit a greater diversity in living standards. Too many people in the area have been forced to skimp and save in order to keep in the game. The writers made no special study of this situation. If the recommendations within this report can be put into effect we believe that incomes will improve. It is a healthy sign when a community recognizes the problems which face it and begin to take community action toward improvement.

Conclusions from the Economic Survey

Yampa area

The data analyzed in the preceding pages were secured in 1936. Records from earlier years were used to check upon the 1936 study.

No information is included here as to actual income on the farms studied. Each farmer was asked to report on his customary or usual cropping system, crop production, livestock production and sales. This would give a better picture of conditions than would result from records for one year's actual business. The writers have seldom worked on a problem where men gave so freely of their time and were so serious in their endeavor to assist in furnishing the desired information. Consequently we believe that the data in this report present a very accurate summary of actual conditions within the area.

This is a good agricultural area. It has suffered from drouth and low prices, but its cattle and sheep production compare favorably with most western range country. The people are agreed upon the need for some changes. They fear arbitrary action. They are ready to sit around the table and help work out their common problems. Data were secured and summarized herein with that object in view.

The writers believe that the community should unite to aid in bringing some improvements into the area, such as a shift from small unsuccessful farms to larger sized livestock farms; an increase in milk production for the cheese factory; a concentration of population in the fertile valleys and a reduction in the cost of maintaining scattered roads and schoolhouses on the higher, rougher grazing lands; a reduction in the present rate of stocking winter range, and an

increase in the use of hay for winter feeding of sheep; an increase in the use of irrigated pasture for beef production; and more uniform rules for the administration and use of public lands. 1/

To assist in these latter suggestions the writers take the liberty of adding to this report some discussion as to present and possible use of the various grazing lands.

Use of Range by Farms of Different Types

The presence of unappropriated public lands is a disturbing element in any community. Everybody claims an equal right to its use; no one assumes any responsibility for its care. Few stop to consider whether its use is of direct benefit, or consider the effect of their actions upon the welfare of their neighbors.

It is not the purpose of this report to decide how, or by whom, public lands shall be used. It is our purpose to point out certain relationships and effects that have a vital bearing upon the welfare of those who use public lands, and of those who live in the community.

Some farms or ranches are of a size and type that they can make efficient and profitable use of range lands, and others are not. Production of hay for winter feeding of livestock is a primary requirement for being able to effectively use summer range, unless stock is wintered on suitable winter range. Location of the farm or ranch, with reference to the range, is also a factor. Possibly the most important consideration is the farmer or rancher--has he had the experience, and does he have the ability, to operate a range livestock outfit successfully? Considerable capital is required to own the necessary livestock, hay lands, and private ranges. In the Yampa River area, the location of the ranch is important, since a given area of farm or range land will produce more feed and forage in the eastern than in the western part of the area.

Dry land crop farms do not have a large production of hay, and could therefore feed only a few head of livestock through the winter. Many dry farmers do not own many livestock now, and do not have capital with which to purchase more stock. Many dry farmers lack experience with range

1/ One point should be stressed in connection with the budgets discussed above. They are based upon feeding rates and expense items listed in Table 6 in the Appendix. Change these rates and values and different results would be obtained. The hay per head of cattle was used as 2 T. In much of the area less than this can be used satisfactorily, which would increase the comparative cattle earnings.

livestock production, also, and would have to go through a period of acquiring experience, during which they might not operate as effectively as the average established rancher. A considerable portion of the dry farmers, especially in Moffat County, were raised elsewhere and migrated to the Yampa River area since maturity. The average dry farm, particularly the smaller ones which are so common, has a low income and is badly in need of additional income, from any possible source. However, the addition of a small number of range livestock to such farms might not increase their incomes materially, and it would mean depriving some other farmer or rancher of this range. Few dry farms have had the resources to acquire private range land. As a class, dry land crop farms are not at present in a position to use public range lands effectively, though there are exceptions.

Small livestock farms can use range lands very effectively, up to the limit of their ability to raise hay for winter feed. Range cattle can be operated on a small scale more effectively than can sheep. Sheep must be herded, and it is uneconomical to herd less than approximately a full band. Two or more ranchers with small flocks of sheep may combine, to place a full band on the range. If sheep are fed, these bands can be split up in the fall and the sheep fed on the farm of their owner. Such arrangements are entirely feasible, but the key to their success lies in the ability of small sheepmen to agree and work together. With careful management, the small ranch can pay a fairly high fee or price for range and still enable the operator to live with a moderately satisfactory standard of living.

The livestock farm which cannot buy or lease private range or get a permit on public range can do very well by using some of its hay lands for irrigated pasture. Farm flocks of sheep on irrigated pasture will do well, if the pasture is not too wet, and cattle will produce more than on range, as has been shown. Cattle run on irrigated pasture for a 6-month season require 1.5 acres per head of pasture and 1 acre of hay land. Thus a ranch which had hay land enough to feed 250 cattle through the winter, would have hay and pasture land enough for only 100 head, if it should cease to use or should lose its summer range. This reduction in number of cattle run, when a ranch changes from range to irrigated pasture cattle production, is the chief obstacle to irrigated pasture cattle production. Where the area of hay and pasture land is large enough, irrigated pasture cattle production is quite satisfactory.

Large livestock farms

(a) Cattle.-- Formerly cattle were grazed on the public domain in northwestern Colorado. In later years with shortage of forage, and drouth, few have made satisfactory gains, and many cattle have been removed from the "free" lands.

(b) Sheep have continued to use the public domain after it was unprofitable for cattle. Sheep can do this because of their ability to exist upon weeds and brush that cattle do not relish. They can also use snow for water. Many operators have built up a sheep business based upon winter grazing on public lands, and summer grazing on the National forests, with owned or leased land for spring and fall grazing. The competition offered by these operators has been a serious handicap to the existence of the cattle men.

The writers hold no brief for either cattle or sheep, but the data shown earlier in this report are ample reason for the trend toward more sheep and less cattle in the area. Sheep producers bring more money into the country. The chief complaint against sheepmen centers around the "drifters"--men who have no permanent home and take no active part in the community life. It is apparent that some regulations as to movement of livestock will remove much of this criticism. Local people, and representatives of the grazing service and of the National Forest should arrange to hear all sides, and work out a mutually acceptable program which will retain the good features of a profitable industry and eliminate the questionable features.

Some criticism is directed toward the "large sheep operator." The authors were interested in the data secured in this study. The data indicated quite clearly that many "large operators" had men working for them who had been with them for 15 to 30 years. Frequently the wage paid to these men exceeded, by several hundred dollars per year, the normal expectation as to income from the independent operation of a privately owned "small livestock ranch," and this without the need for any investment or risk of loss.

Since this is the case, it would seem to be an advantage to have in a community two ways to make a living - one by individual ownership and operation of a ranch, the other by working for a competent large scale operator.

Desirable Policies for Public Range Use.-- This economic survey has furnished information which should be helpful in formulating future policies. What constitutes a desirable

goal or policy depends to a large extent on the kind of things each person values most highly. One person feels that those policies should be adopted which will result in the maximum population for an area, another wants satisfactory incomes for everyone living in the area, another is primarily concerned with the protection and preservation of the natural resources, and so on. Within the Yampa River area there are conflicting interests and desires on the part of various people, and it would be impossible to formulate any program which would fully satisfy everyone.

Some of the problems are highly controversial. Many require, for their solution, data and experiences which cannot be secured within the limited time allotted to this study. The writers wish to emphasize the economic sides of these problems. If due consideration is given to economic factors as well as to custom and tradition, it is our hope and belief that a satisfactory answer can be found for practically all these problems. Government officials are bound by law or regulations handed down from superior officers. The general public must recognize this and be patient, while men learn and correct the mistakes made through one cause or another. A few quotations may help toward a better understanding. The National Forest Manual, page 3G, states: "Every effort will be made to distribute the stock on the range satisfactorily in order to secure greater harmony among the users of the forest, to reduce waste of forage through unnecessary movements of stock, and to obtain a more permanent, judicious, and profitable use of the range." "There is no law which gives an individual or corporation the right to graze stock upon National forest lands. The grazing of such lands may be allowed by the Secretary of Agriculture only as a personal privilege."

"The primary obligation of government (is) to require the conservative use of national resources," as stated in a letter dated May 13, 1936, written by Mr. C. M. Granger, acting chief of the Forest Service.

The Taylor Grazing Act as amended July 26, 1936 states the purpose of the act: "To stop injury to the public grazing lands by preventing overgrazing and soil deterioration, to provide for their orderly use, improvement, and development, to stabilize the livestock industry dependent upon the public range, and for other purposes."

These quotations give one a clear picture of the responsibility laid upon the shoulders of administrative officials. With those in mind let us consider some policies and briefly outline their economic and practical phases.

The basis for awarding permits:- In the National Forest this has been upon properly qualified persons. In the Grazing Administration it has been based upon properly qualified lands. Some quotations from page 18G of the National Forest Manual will serve as an indicator of National Forest policy: "For the purpose of contributing to the stability of the livestock industry---- the Forests shall provide for the recognition of preference in the use of National Forest ranges and the renewing of permits to an extent consistent with the prevention of monopoly and with the principle of a reasonable distribution of grazing privileges." Page 19G, "A preference may be acquired in the allotment of grazing privileges, but no legal right will accrue to the National Forest range."-----"Preferences may be acquired in the following ways (a) by prior use and occupancy of lands included within a National Forest, (b) by local residence and ownership of commensurate ranch property dependent upon the range." (Four other methods are listed such as inheritance, purchase of stock or ranches, regular use, and renewal to co-partners.) Page 21G, "A permittee with a preference may change his residence to a point more remote from the forest without affecting the status of his preference, provided he maintains his other interests"-----"a permittee-----may dispose of such property, but unless he secures equally dependent and commensurate ranch property within a reasonable time his preference may be revoked."

It is significant that the National Forest gives permits to individuals, but does so only upon the basis of lands owned.

The chief arguments in favor of giving the permit on the basis of land, and, once given, kept for that specific tract of land, are briefly as follows:

1. It introduces stability into the grazing program.
2. It opens a way for future adjustments, i.e., when such lands are acquired, the use of National Forest grazing goes with them.
3. It permits lease of the land and use of the grazing privileges by the tenant.
4. It removes a continual pressure from new applicants for consideration for new permits.
5. New applicants will be new owners of old lands, hence a new applicant will replace an old permittee, not crowd him out.

6. It gives somewhat the same impersonal standing to a grazing permit that now attaches to a water priority for irrigation.

7. These tend toward a condition of greater security, and a feeling of confidence. They would help to remove the frequent hard feeling, misunderstanding, and jealousies now present.

The chief arguments in favor of giving the permit on the basis of persons may be summarized as follows:

1. It recognizes that individuals are the actual users of permits.

2. It is easier to keep a check upon the individual, and to control his permit.

3. It prevents the tendency to look upon a permit as a "right", which is superior to any policy of the government.

4. It recognizes that the demand for grazing is in excess of the available supply - therefore a selection must be made.

5. It recognizes that the dependent ranches are in excess of the available supply of grazing.

6. It allows for a selection of individuals rather than of units of land.

7. These all tend toward greater elasticity and freedom for adjustment in selecting permittees.

8. It gives greater elasticity in administering public lands and in providing for other uses which may be higher than grazing.

A comparison of these opposing arguments and their relative merits should be made with due regard for the overlying policy "of the greatest good to the community," and "the greatest stability of the livestock industry."

It is not the purpose of this economic study to decide National Forest policies, but merely to secure data upon which such policies may be based. Field work on this specific problem has been done two years, 1935 and 1936. The Colorado State College has made a study of selected cattle and sheep ranches in this area for the years 1926 to 1934 inclusive.

Possibly this experience justifies a comment as to which policy would benefit the area economically. If proper safeguards as to qualifications of individuals could be blended with choice of ranches within dependent territory, it seems to the writers that a selection of permittees could be made which would meet with the critical test of fairness to all concerned. Then if proper regulations could be drawn looking to the future, the community would have a recognized accepted policy, upon which all could agree, which would permit the normal changes of ownership and of movement of population to continue. Where men were unadapted to handling livestock, their lands would not be qualified for permits. In other words, a "rule of reason" could create a blend of land and person as the basis of permits, with benefit to both sides.

Specific tracts of public range:- The tendency among National Forest officials and grazing administration officials is toward giving a permit for a specific tract of public lands. All arguments seem to point toward this as a desirable goal. Proper regulations to cover future changes in carrying capacity, or public needs for other uses such as for recreation, reservoir sites, or game refuges, should be worked out.

In actual practice, the Forest Service is following and has been for some time a policy very similar to this, as regards allotment of specific tracts of range. But we feel this policy should be made more definite and of wider application and that it should be the recognized, announced policy, not just one that has grown up through administrative policy.

"Protection of range vs. distribution:- The National Forest Manual, page 23G, states: "Reductions on grazing preferences are made for two purposes - protection and distribution"---"Distribution may be defined as the granting of preferences to qualified New Class A applicants and increasing preferences to qualified Class A permittees below the protective or exemption limit."

Cuts for protection when needed are sound and meet with universal approval.

Cuts for distribution arose from fear that monopoly would control the range. Where the range is fully used it means that some new man is given a chance at the expense of someone who is now established. 1/ Giving one man a permit at the expense of another does not add to community welfare. It merely keeps everyone in a state of uncertainty. It prevents a permittee from taking an interest in his allotment. He will hesitate to cooperate in building up the range if there is no security in its use.

It would be a sound policy to issue a permit to a new applicant when he comes bearing a record of purchase of land, or livestock, or both, from a former permittee. Obviously, consideration should be given to the proper use of National Forest or public domain lands which had been used by a permittee who drops out and no one comes qualified to replace him*with livestock.

Commensurability^{2/} seems to be a reasonable basis for selecting permittees. This study indicates that (a) only those lands should be accepted as commensurate property, which are definitely useful to the ranch in its year's operations. In the past, the Forest Service has "accepted" (which really means "required") property as commensurate which was of little use to the rancher. A sheepman who runs on winter range should not be required to own hay lands, which produce hay for winter feeding, except for supplemental feeding. Due

1/ The old government policy of settlement also accounts in part for these distribution cuts. The present trend of government policy is toward stabilizing existing settlers and retiring submarginal operations, i.e., resettlement activities.

2/ Defined by the National Forest as follows: The term "commensurate property" means property of the kind and amount necessary to furnish feed or forage for the class of stock in accordance with the custom of the locality during the portion of the year when it is not grazed upon the national forest.

regard should be given to the seasonal adaptability of commensurate property-ownership of summer range does not constitute commensurability for more summer range, etc. A deficiency of spring-fall range is not offset by surplus hay production for winter feeding.

(b) Lands submitted as commensurate property should be properly used, as far as seasonal use, rate of stocking, etc., are concerned. One federal agency should not permit or encourage mis-use of private lands, while at the same time other federal agencies (soil conservation service) are paying ranchers and farmers to properly use their lands. The rating attached to each type of land should be such as to permit its proper use--if certain ranges will be injured by spring use, they should not be accepted for commensurability as spring range, for instance. Commensurability ratings in the past have pretty well, but not entirely, achieved this objective.

(c) Lands which are submitted for commensurability in a certain way, and accepted in that way, should be used as submitted. For instance, a tract of spring-fall range submitted as commensurate property should not be used as summer range. In the past, property has often been submitted as commensurability in one way, and used in quite another way. A common situation has been for a man to offset a shortage of spring-fall range by producing more hay, and then proceed to use the limited spring-fall range for all his stock all season, and sell the hay. If commensurability standards are properly set in the first place, there is no reason why a permittee should be allowed to use commensurate property in some other way. Mis-use of commensurate land should be sufficient ground for rejection of property for commensurability.

These limitations and interpretations seem necessary if commensurability is to be a workable method of determining eligibility for the use of public lands.

It does not answer the question as to choice between equally worthy applicants, when there is not enough grazing for all those who wish to use it. This is a problem which is local, and should be settled on the basis of a minimum of disturbance of established operators, and for the best interests of the community as a whole.

The application of commensurability will mean that many operators will be faced by several alternatives. They will find it necessary to reduce their livestock numbers, or buy additional grazing lands, or increase the use of supplemental feed, chiefly during the winter grazing of public domain.

Selection of permittees:- The writers have listened to many arguments as to who should, or should not, be given a permit for the use of public lands. From this discussion, two classes of applicants emerge as most dissatisfied, or as targets of criticism.

(a) Small operators.- This phrase is used advisedly. Every man has a private definition of "small." Careful study of the budgets shown earlier in this report, will indicate the limitations of income when a rancher has less than 50 head of cattle or less than 200 head of sheep. It is not for the best interests of a community to encourage a scale of living, or size of business that merely allows the operator to subsist. Every effort should be directed toward aiding men toward a more profitable business.

A grazing permit, for a number of livestock so small the operator has little or no chance of making a good living, is a questionable asset. There are, at present, some permittees whose operations are below the minimum point at which a reasonable living can be obtained. Such permits should not be disturbed during the continued activity of the present holder. No new permits should be granted that are below "family-size." Just how large the minimum unit should be, is hard to say; there is a temptation to set it too high, where the family income would be fairly good, but where many people could not reach it. A farm with about 20 head of cattle, the cows being all milked, or one with about 65 head of beef cattle, or one with about 200 sheep, under the long time average prices assumed in the budgets will pay the operator going wages for farm labor, with little left to pay interest on investment in land or livestock. Certainly new permits should not be granted to farms smaller than these. How much larger should the farm be before a permit is given? Farms twice this size would still not be very large, and might be held up as a reasonable goal.

An economic unit:- At the outset of this study, one of the facts sought was, what is the proper size of an economic unit? It should be fairly obvious that there are as many sizes of "economic units" as there are individuals who are in business after a period of years. In other words, each man has his own idea as to what is required. Some, it is true, hang on in hopes of better days, and would prefer a larger business. But it would be absurd to set up a mythical farm and say, "Here is an ideal, economic unit, if you fail to measure up to this standard, you will receive scant consideration when government favors are dispensed."

It would be far better to face the facts of limitation of income which are indicated for some of the smaller farms summarized in budget form on earlier pages of this report, and

join in community endorsement of every policy which will tend to reduce the number of such farms, and increase the number of other farms which do offer a long time opportunity for better income.

(b) Large Operators:- These men, under the present system of paying fees, have definite advantages. In the past the National Forest has used a "maximum limit" as an arbitrary attempt to avoid the development of monopoly in use of grazing.

If the suggestion made later, that fees be increased up to their full value should be put into effect, the advantages of size will largely disappear. There will be little tendency to develop monopoly. Under these proposed conditions the writers see no economic argument for placing an arbitrary limit upon the size of ranches.

But if fees less than their full value are retained, then a maximum limit to size of permit is highly desirable. There should be some limit to the amount of low cost range which is allotted to any one person. How large this limit should be is not an easy point to settle. Many conditions need to be studied. Possibly it would differ for different kind of public lands. But once it is agreed upon it should be fairly administered, and a period of years should be allowed, within which the operator above this limit should be given time to make the needed adjustments without being forced to sell livestock with no chance to pick a favorable time.

(c) Residence of applicant has been advanced as a basis for selecting permittees. A careful study of the geography of any western lands adjacent to National forests, or public domain, will convince the impartial student that political boundary lines are not a sound guide to the selection of those who are most dependent upon any specific area of public lands for their balanced year round operation.

It is much more important that fees be put upon a fair basis, and that national administrative agencies pay their fair share of such fees to local governmental units in lieu of taxes. When this is done, and permittees selected upon a uniform basis, little objection will be raised as to the residence of the permittee.

Stability of permits:- There should be "one best way" of allotting permits on public lands. Once that way is found, agreed upon, and used, it should reduce the uncertainties, and make a permit relatively permanent, subject to proper restrictions to prevent a feeling or belief that permits are rights rather than privileges.

In the absence of any such "one best way" in the past, there has been a feeling on the part of those who do not have permits, that they were unfairly discriminated against, and a resultant continued pressure to force supervisors of public range to reallocate the use of range. This has never worked to the satisfaction of many. It should be abandoned and permanency of permits recognized as a desirable goal.

It bears repetition that range resources are limited - when fully used, and a new man is given a chance, it can be done only at the expense of someone who is already established.

Stability of permits will give permanence to communities; it will improve the security of loans for operation of ranches; it will give the operator a chance to plan ahead and work out a long time policy for the best use of his lands and resources.

Elimination of inequalities:- If permits are given an added degree of stability, care must be taken that it does not add to, rather than eliminate inequalities.

The previous analysis has shown that fees on the National Forest and public domain are not high enough to pay for the value of the forage secured. The rancher with a permit is in a favorable position. If he is protected in the permit, it will tend to give permanence to his economic advantage. With these low fees, he can outbid non-users of public lands, when each desires to buy or lease private lands.

In view of these facts, the authors see only one way in which permittees, as a class, and non-permittees, as a class, can be put on an equal basis--raise the fees on public ranges to the full value of the forage, on the basis of long-time average prices of livestock and on the basis of the portion of the year the livestock are on a particular kind of land, or to the cost of private lands of the same character, whichever is the lower. If the fees for use of each tract of land are placed at just what the forage on that land is worth, there is no longer any need to get worried over the financial advantage one type of operator has over another, or to require unnecessary commensurability standards to offset the advantage of low fees. The man who does not have a permit cannot afford to bid for private land in competition with the man who does.

There are many problems in determining the value of forage on a particular range, and it is probably impossible to value each tract at its exact value. But the essential point is to value Forest and public domain lands as a whole on a par with private range lands, as a whole. Fees should certainly vary according to the location and accessibility

of the range, its carrying capacity, the production of beef, lamb, or wool per head, and the costs of operating on that range. All of these items need a careful determination of facts. Fees might also vary from year to year, according to the price of livestock. If this is desired, they should bear some definite ratio to some well-known and quoted price, so that there could be no room for dispute or debate over the amount of the fees.

In working out such fees, the problem of cattle vs. sheep will come to the front. In parts of the eleven western states cattle are more productive than sheep; in other areas, sheep are more profitable. As shown earlier, the Yampa River basin in Colorado is apparently more profitable for sheep production. If this relationship continues, the shift from cattle to sheep, which has been taking place since the World War, will continue. Either that or cattlemen will increase their production of beef per head through better methods of handling cattle, or increase the milking of cows. The growth of the cheese industry in the valley suggests that this adjustment is already under way. It will add to the community income and should be encouraged.

Some may object to the conclusion that sheep pay better than cattle and ask, What of the future? The writers concluded from this study, and the analysis of cattle and sheep prices over the past 45 years, that sheep can make a better showing. We can see nothing to change that situation in the future. True, there will be individual years when cattle prices will be favorable, but they will not offset the years when sheep are more profitable. Furthermore, the outcome of farm planning and soil conservation in the Middle West will undoubtedly result in an increase in the number of cattle pastured and raised in the Mississippi Valley. Sheep in that valley have serious limitations due to insect pests. It seems reasonable to anticipate a trend toward more favorable sheep production for the western range, rather than more favorable cattle production.

Crossing permits:- The National Forest Manual, page 14G, states: "This regulation (of crossing permits) is for the purpose of allowing a reasonable movement of stock across National Forest lands for any legitimate purpose, but under controlled conditions that will insure that the crossing privilege is not abused and does not result in damage to forest lands or other related interests."

The March 2, 1936 issue of Rules for Administration of Grazing Districts, page 9, states: "Crossing licensees shall follow the route prescribed in the crossing license, at a rate of not less than five (5) miles per day for sheep or goats, and ten (10) miles per day for cattle and horses."

This study disclosed the need for strict enforcement of driveway regulations and for some method for controlling the driving of livestock over private lands, to reduce the present controversy over methods of settlement for use of grazing enroute.

Time of Issuing Permits

The National Forest Manual, page 23G, states: "Protection reductions may be made at the close of any grazing season---" This statement would suggest that the Forest Service favored making changes in permits in the fall of the year. In practice most permits are issued in the spring.

The tendency to issue permits in the spring puts the permittees at a disadvantage if a reduction is made in the number of livestock. If reductions are made in the fall months, the rancher has several months within which to make needed adjustments to meet the reduction in his permit. When the reduction is deferred until spring, he must act quickly, and may be forced to sell at a disadvantage.

The writers suggest that administrative officials announce reductions in the fall, or else make some allowance for time to meet the reduction when cuts are made in the spring.

Land Use and Social Welfare

The Forest Service has used "Dependency Zones" as one means of limiting the number of applicants for grazing permits. These zones tended to encourage the settlement of foothill and high elevation homesteads by those who wished to use the National Forest. Many of these homesteads were unable to support a family at anything but a subsistence scale of living. At the same time they made extra demands upon the community to furnish roads, schools and other improvements, either through taxation or by private investment.

The majority of these homesteads were on lands well adapted to grazing and poorly adapted to crops. Many of them have reverted to the counties through tax delinquency. Many have been purchased as grazing land.

The community should recognize the benefit of having its population distributed along the valley floors where roads, schools, electricity, telephones, and other improvements can be secured for the least expense. This will leave the rough, inaccessible and higher lands for grazing and will require a minimum of expense in furnishing roads or other improvements.

Conclusion as to Public Lands:- The suggestions made above, if put into effect, would result in considerable change in the present use of range lands. Time should be given for needed adjustments, and careful hearing should be given to all sides of the question. No one should be forced to make sudden changes in the set-up of his ranch. No new applicants should be admitted until present permittees have been given time either to qualify or to adjust their operations.

In making these adjustments an opportunity should be given for everyone to present his case, and to criticize the whole program and the claims made by all applicants. Something resembling the public meetings of the livestock associations should be held before Forest permits are changed or reallocated. There should be ample opportunity for everyone to learn all the facts about each situation, and to express his views on it.

Both the Forest Service and the Division of Grazing have provision for the review of the action of the local administrative agency, by a higher authority within the same Service. This arrangement should certainly be continued. Before any change in policy with respect to game and wildlife was adopted, local hearings should be held and approval obtained as far as possible from all interested agencies.

Policy for State and County Range Lands

This study has concerned itself chiefly with Federal range lands. The State of Colorado owns a considerable area of range land, part of the grant made by the Federal government to assist in providing education within the State. Routt and Moffat counties have taken title to some tax delinquent range land, and can take title to more land. These range lands should be used in conformity with principles similar to those laid down for Federal lands. County and State lands could be more effectively administered if they could be consolidated, by exchange with Federal or private lands.

State and County lands might well be leased on long-term leases. The present system of competitive bidding on State lands is certainly not conducive to protection and preservation of the forage on the lands, nor to their most effective use, and it is questionable if higher incomes are secured than might be obtained from longer term leases. State lands might be leased at a price to equal or exceed the appraised value of the forage produced. State and County lands on long-term leases should be accepted in part as commensurate property for permits on Federal range lands. Counties should develop some constructive policy for the handling of their range lands.

Counties and local governmental units can assist private land owners in bringing about best use of land. No good is accomplished by assessing range land at more than it is worth, and having it tax delinquent half of the time; and a great deal of harm may be done, through the efforts of the owner to get taxes out of it through drastic overgrazing. Taxes should be adjusted to some share of what the land earns.

APPENDIX

Table 1. Number of farms in Moffat and parts of Rio Blanco counties (Yampa River drainage) Colorado by acreage and type of crop land, and by numbers and kind of livestock, 1935.

Crop acreage and numbers of livestock:		Dry-farm	Irrigated:	Irrigated:	Total
		crop land:	crop land:	and dry	
				farm crop:	
				land	
1. Farms with less than 50 acres crop land	:196	: 59	: 21	:276	
a. with less than 10 cattle	: 154	: 31	: 12	: 197	
b. " 10 or more "	: 37	: 21	: 7	: 65	
c. " sheep	: 5	: 7	: 2	: 14	
2. Farms with 50-89 acres crop land	:136	: 30	: 42	:208	
a. with less than 10 cattle	: 80	: 10	: 18	: 108	
b. " 10 or more "	: 55	: 10	: 20	: 85	
c. " sheep	: 1	: 10	: 4	: 15	
3. Farms with 90-129 acres crop land	: 40	: 15	: 24	: 79	
a. with less than 10 cattle	: 20	: 6	: 9	: 35	
b. " 10 or more cattle	: 18	: 8	: 14	: 40	
c. " sheep	: 2	: 1	: 1	: 4	
4. Farms with 130 or more acres crop land	: 44	: 46	: 48	:138	
a. with less than 10 cattle	: 12	: 3	: 14	: 29	
b. " 10 or more "	: 32	: 27	: 28	: 87	
c. " sheep	: 0	: 16	: 6	: 22	
5. Farms with grazing land only	:	:	:	:129	
a. with less than 10 cattle	:	:	:	: 74	
b. " 10 or more "	:	:	:	: 33	
c. " sheep	:	:	:	: 20	
6. Farms reporting no land	:	:	:	:148	
a. with less than 10 cattle	:	:	:	: 60	
b. " 10 or more "	:	:	:	: 43	
c. " sheep	:	:	:	: 45	
Total	:416	:150	:135	:976	

Based on County Assessor's records.

Appendix

Table 2. Number of farms in Routt County, Colorado, by acreage and type of crop land, and by number and kind of livestock, 1935.

	Dry-farm	Irrigated	Irrigated	All
Crop acreage and numbers of livestock:	crop land	crop land	& dry	farms
			farm crop:	
			land	
1. Farms with less than 50 acres				
crop land	380	72	64	516
a. with less than 10 cattle	310	57	38	405
b. " 10 or more "	59	13	20	92
c. " sheep	11	2	6	19
2. Farms with 50-89 acres crop land	138	27	94	259
a. with less than 10 cattle	91	12	44	147
b. " 10 or more cattle	43	12	43	98
c. " sheep	4	3	7	14
3. Farms with 90-129 acres crop land	37	23	62	122
a. with less than 10 cattle	18	16	20	54
b. " 10 or more "	19	3	39	61
c. " sheep	0	4	3	7
4. Farms with 130 or more acres				
crop land	28	27	133	188
a. with less than 10 cattle	11	16	39	66
b. " 10 or more "	13	11	78	102
c. " sheep	4	0	16	20
5. Farms with grazing land only				26
a. with less than 10 cattle				11
b. " 10 or more "				11
c. " sheep				4
6. Farms reporting no land				169
a. with less than 10 cattle				53
b. " 10 or more "				96
c. " sheep				20
Total	583	149	353	1280

Based on County Assessor's records.

Appendix

Table 3. Number of farms in Yampa River drainage, Colorado, by acreage and type of crop land, and by number and kind of livestock, 1935

Crop acreage and numbers of livestock:	Moffat & Rio Blanco Counties	Routt County	Total
1. Farms with less than 50 acres crop land	276	516	792
a. with less than 10 cattle	197	405	602
b. " 10 or more "	65	92	157
c. " sheep	14	19	33
2. Farms with 50-89 acres crop land	208	259	467
a. with less than 10 cattle	108	147	255
b. " 10 or more "	85	98	183
c. " sheep	15	14	29
3. Farms with 90-129 acres crop land	79	122	201
a. with less than 10 cattle	35	54	89
b. " 10 or more "	40	61	101
c. " sheep	4	7	11
4. Farms with 130 or more acres crop land	138	188	326
a. with less than 10 cattle	29	66	95
b. with 10 or more "	87	102	189
c. " sheep	22	20	42
5. Farms with grazing land only	127	26	153
a. with less than 10 cattle	74	11	85
b. " 10 or more "	33	11	44
c. " sheep	20	4	24
6. Farms reporting no land	148	169	317
a. with less than 10 cattle	60	53	113
b. " 10 or more "	43	96	139
c. " sheep	45	20	65
Total	976	1280	2256

Based on County assessor's records.

Appendix Table 4. Normal acre yields of crops by communities, Yampa River drainage, Colorado

Community or location	Timothy & Clover Hay		Alfalfa Hay		Dry		Wheat - dry		Oats - dry		Potatoes - dry	
	Farms	report-	Farms	report-	Farms	report-	Farms	report-	Farms	report-	Farms	report-
	ing	Yield	ing	Yield	ing	Yield	ing	Yield	ing	Yield	ing	Yield
	: :	: tons	: :	: tons	: :	: tons	: :	: cwt.	: :	: cwt.	: :	: cwt.
Yampa	10	1.9										
Elk River	9	2.3			5	1.2						
Steamboat	18	2.0	4	2.0	12	1.6	12	13.3	19	14.0	8	68
Williams Fork	10	1.7	6	2.4	13	1.2	11	12.3	8	10.7		
Craig & Hayden	6	2.0	7	1.7	9	.7	14	13.1	6	12.2	4	48
Fortification Cr.			6	1.4	5	1.2	5	13.4	6	10.6		
Baggs	8	1.9	5	2.0								
Great Divide					6	.8	3	8.9			5	26
Entire area	64	2.0	37	1.9	54	1.2	51	12.8	47	13.1	22	54

Only those communities included which had sufficient number of reports to give a reliable average.

Appendix Table 5.- Comparative budgets for farms of various sizes
and types, Yampa River drainage, Colorado
showing results for 1934

Item	40-acre crop farm		40-acre		40-acre
	Irrigated	Dry land	Irrigated	Dry land	farm, cattle
	Chiefly grain	Some potatoes	Chiefly grain	Some potatoes	Irrigated crop land
	toes	toes	toes	toes	
Acreage grown of: grain	30	20	30	20	10
hay	10	10	10	10	30
potatoes		10		10	
Acreage owned of: irrig. pasture					43
private range	54	54	54	54	89
Average number of: cattle	1	1	1	1	25
sheep					
Quantity sold: grain, cwt.	614	346	284	162	28
hay, tons	14	14	6	6	6
potatoes, cwt.		536		304	
beef, cwt.					36
lamb, cwt.					
butterfat, lbs.					4000
wool, lbs.					
Cash income from: crops sold	684	954	314	576	58
livestock sold	28	28	28	28	121
" products sold					1120
Total	712	982	342	604	1299
Expenses for: feed purchased					4
hired labor	20	115	20	95	20
shearing, etc.					
threshing	73	49	38	29	23
taxes on land & l.s.	45	45	21	21	105
breeding stock purch.					50
misc. cash costs	80	80	80	80	80
Grazing costs & fees					
Total	218	289	159	225	282
Receipts less expenses	494	693	193	379	1017
Operator's wages	494	600	183	379	600
Return on investment		93			417
Months labor employed	12 1/3	14	12 1/3	13 2/3	12 1/3
(assuming operator employed 12 mo.)					

Appendix Table 5.- Comparative budgets for farms of various sizes
and typos, Yampa River drainage, Colorado

Item	80-acre crop farm					
	Irrigated			Dry land		
	Chief-ly :grain	Chief-ly :hay	Some- :potatoes	Chief-ly :grain	Chief-ly :hay	Some- :potatoes
Acres grown of: grain	70	20	40	70	20	40
hay	10	60	20	10	60	20
potatoes	-	-	20	-	-	20
Acres owned of: irrig. pasture	-	-	-	-	-	-
private range	91	91	91	91	91	91
Average number of: cattle	1	1	1	1	1	1
sheep	-	-	-	-	-	-
Quantity sold: grain, cwt.	1460	345	797	796	161	410
hay, tons	10	109	30	2	62	14
potatoes, cwt.	-	-	1088	-	-	784
beef, cwt.	-	-	-	-	-	-
lamb, cwt.	-	-	-	-	-	-
butterfat, lbs.	-	-	-	-	-	-
wool, lbs	-	-	-	-	-	-
Cash income from: crops sold	1510	890	2035	806	471	1234
livestock sold	28	28	28	28	28	28
" products sold	-	-	-	-	-	-
Total	1538	918	2063	834	499	1292
Expenses for: feed purchased	-	-	-	-	-	-
hired labor	95	100	175	60	60	135
shearing, etc.	-	-	-	-	-	-
threshing	167	47	96	96	27	54
taxes on land & live-	-	-	-	-	-	-
stock	87	87	87	39	39	39
breeding stock purch.	-	-	-	-	-	-
misc. cash costs	160	160	160	160	160	160
grazing costs and fees	-	-	-	-	-	-
Total	509	394	518	355	286	338
Receipts less expenses	1029	524	1545	479	213	904
Operator's wages	600	524	600	479	213	600
Return on investment	429	-	945	-	-	304
Months of labor employed	13 2/3	13 2/3	15	13	13	14 1/3
(assuming operator employed 12 mo.)						

Appendix Table 5. (Cont'd).--Comparative budgets for farms of various sizes and types, Yampa River drainage, Colorado.

Item	:80-acre L.S. farm:	Cattle:	Cattle	
	: Irrig. and dry	:ranch	:ranch	
	:beef	: sheep	:300	:500
	:cattle	:	:head	:head
Acreage grown of: grain	20	20	40	60
hay	60	60	316	522
potatoes	-	-	-	-
Acreage owned of: irrig. pasture	-	222	29	41
private range	877	-	4999	8244
Average number of: cattle	56	1	300	500
sheep	-	474	-	-
Quantity sold: grain, cwt.	145	144	81	121
hay, tons	-	9	-	-
potatoes, cwt.	-	-	-	-
beef, cwt.	148	-	792	1320
lamb, cwt.	-	284	-	-
butterfat, lbs.	-	-	-	-
wool, lbs.	-	3745	-	-
Cash income from: crops sold	145	189	81	121
livestock sold	1027	2300	5374	8938
"products sold	-	824	-	-
Total	1172	3313	5455	9059
Expenses for: feed purchased	8	38	41	68
hired labor	120	230	860	1290
shearing, etc.	-	95	-	-
threshing	32	32	62	93
taxes on land & livestock	117	350	971	1595
breeding stock purchased	100	132	650	1100
misc. cash costs	160	160	712	1164
grazing costs and fees	-	-	-	-
Total	537	1037	3296	5310
Receipts less expenses	635	2276	2159	3749
Operator's wages	600	600	600	600
Return on investment	35	1676	1559	3149
Months of labor employed	14	16	27 1/3	30

Appendix Table 5 (Cont'd).- Comparative budgets for farms of various sizes and types, Yampa River drainage, Colorado

Item	:200-acre crop farm:		Sheep fed in winter	
	:dryland : grain	: Irrig. : hay	: $\frac{1}{2}$ band : outfit	: 1 band : outfit
Acreage grown of: grain	180	40	20	20
hay	20	160	75	147
potatoes	-	-	-	-
Acreage owned of: irrig. pasture	-	-	9	14
private range	204	204	3308	6585
Average number of: cattle	1	1	1	1
sheep	-	-	615	1230
Quantity sold: grain, cwt.	2124	722	121	49
hay, tons	2	298	9	17
potatoes, cwt.	-	-	-	-
beef, cwt.	-	-	-	-
lamb, cwt.	-	-	369	738
butterfat, lbs.	-	-	-	-
wool, lbs.	-	-	4858	9717
Cash income from: crops sold	2134	2212	166	134
livestock sold	28	28	2980	5932
"products sold	-	-	1069	2138
Total	2162	2240	4215	8204
Expenses for: feed purchased	-	-	44	87
hired labor	285	285	455	925
shearing, etc.	-	-	123	246
threshing	237	94	32	32
taxes on land & live-				
stock	89	209	449	877
breeding stock purchased-	-	-	154	319
misc. cash costs	400	400	190	334
grazing costs and fees	-	-	-	-
Total	1011	988	1447	2820
Receipts less expenses	1151	1252	2768	5384
Operator's wages	600	600	600	900
Return on investment	551	652	2168	4484
Months of labor employed	17	17	19	26 $\frac{1}{3}$

Appendix Table 5 (Cont'd). - Comparative budgets for farms of various sizes and types, Yampa River drainage, Colorado.

Item	Sheep ranged in winter			
	$\frac{1}{2}$ band outfit	1 band outfit	1 band outfit on all owned land	4 band outfit
Acreage grown of: grain	-	-	-	-
hay	-	-	-	-
potatoes	-	-	-	-
Acreage owned of: irrig. pasture	-	-	-	-
private range	3240	6481	18,311	25,924
Average number of: cattle	-	-	-	-
sheep	615	1230	1230	4920
Quantity sold: grain, cwt.	-	-	-	-
hay, tons	-	-	-	-
potatoes, cwt.	-	-	-	-
beef, cwt.	-	-	-	-
lamb, cwt.	320	640	640	2558
butterfat, lbs.	-	-	-	-
wool, lbs.	5658	11,316	11,316	45,264
Cash income from: crops sold	-	-	-	-
livestock	2560	5120	5120	20,464
"products sold	1245	2490	2490	9958
Total	3805	7610	7610	30,422
Expenses for: feed purchased	215	426	426	1711
hired labor	560	895	895	4460
shearing, etc.	123	246	246	984
threshing	-	-	-	-
taxes on land & live-				
stock	354	707	1654	2825
breeding stock purch.	154	319	319	1276
misc. cash costs	190	362	362	1448
grazing costs and fees	131	262	62	1046
Total	1727	3217	3964	13,750
Receipts less expenses	2078	4393	3646	16,672
Operator's wages	600	900	900	1,800
Return on investment	1478	3493	2746	14,872
Months of labor employed	20	25	25	80

Appendix Table 5 (Cont'd).- Comparative budgets for farms of various sizes and types, Yampa River drainage, Colorado

Item	: Sheep ranch - 1 band		
	:using:	:using:	:using:
	:80%	:70%	:60%
	:lamb	:lamb	:lamb
	:crop	:crop	:crop
Acreage grown of: grain	20	20	20
hay	147	147	147
potatoes	-	-	-
Acreage owned of: irrig. pasture	14	14	14
private range	6437	6437	6437
Average number of: cattle	1	1	1
sheep	1230	1230	1230
Quantity sold: grain, cwt.	49	49	49
hay, tons	17	17	17
potatoes, cwt.	-	-	-
beef, cwt.	-	-	-
lamb, cwt.	632	539	445
butterfat, lbs.	-	-	-
wool, lbs.	9717	9717	9717
Cash income from: crops sold	134	134	134
livestock sold	5068	4337	3592
" products sold	2138	2138	2138
Total	7340	6609	5864
Expenses for: feed purchased	87	87	87
hired labor	925	925	925
shearing, etc.	250	250	250
threshing	32	32	32
taxes on land & livestock	860	860	860
breeding stock purchased	319	319	319
misc. cash costs	334	334	334
grazing costs and fees	-	-	-
Total	2807	2807	2807
Receipts less expenses	4533	3802	3057
Operator's wages	900	900	900
Return on investment	3633	2902	2157
Months of labor employed	28 1/3	28 1/3	28 1/3

Appendix Table 5 (Cont'd).-- Comparative budgets for farms of various sizes and types, Yampa River drainage, Colorado.

Item	Cattle ranch - 296 head		
	using	using	using
	70%	60%	50%
	calf	calf	calf
	crop	crop	crop
Acreage grown of: grain	40	40	40
hay	316	316	316
potatoes	-	-	-
Acreage owned of: irrig. pasture	29	29	29
private range	4999	4999	4999
Average number of: cattle	296	296	296
sheep	-	-	-
Quantity sold: grain, cwt.	85	85	85
hay, tons	8	8	8
potatoes, cwt.	-	-	-
beef, cwt.	810	736	639
lamb, cwt.	-	-	-
butterfat, lbs.	-	-	-
wool, lbs.	-	-	-
Cash income from: crops sold	125	125	125
livestock	5495	4993	4341
" products sold	-	-	-
Total	5620	5118	4466
Expenses for: feed purchased	41	41	41
hired labor	860	860	860
shearing, etc.	-	-	-
threshing	62	62	62
taxes on land & live-			
stock	968	968	968
breeding stock purch.	650	650	650
misc. cash costs	712	712	712
grazing costs & fees	-	-	-
Total	3293	3293	3293
Receipts less expenses	2327	1825	1173
Operator's wages	600	600	600
Return on investment	1727	1225	573
Months of labor employed	27 1/3	27 1/3	27 1/3

Table 6.- Production and expenso rates used in computing
farm and ranch budgets, Yampa River drainage,
Colorado.

1. Crop yields per acre:

	<u>Irrigated</u>	<u>Dry land</u>	
Wild hay	1.3		tons
Timothy and clover	2.0		"
Alfalfa	1.9	1.2	"
Wheat	24.4	12.8	cwt.
Barley	19.8	15.5	"
Oats	21.2	13.1	"
Potatoes	77	54	"
Pasture	.3 acre per animal unit month (irrigated)		
Grazing land	3.14 acres per animal unit month (dry)		

2. Livestock production per head:

Beef cattle	36% turnoff 264 lbs. beef
Dairy "	23 lbs. butterfat 53% calf crop sell $\frac{1}{2}$ veals at \$1.00 cull cows at \$3.00 @ 900 lbs.
Sheep on hay	78% turnoff 60 lbs. lamb and mutton 7.9 lbs. wool
Sheep on rango	68% turnoff 52 lbs. lamb and mutton. 9.2 lbs. wool
Work horses	Work on 20 acres of crops

3. Foeding rates for livestock, per head:

	<u>Hay</u>	<u>Grain</u>	<u>Cottonseed cake</u>
Horses & dairy cows	2 tons	.3 T	
Cattle (all ages)	2 "	.05T	
Hogs		750 lbs.	
Poultry		60 "	
Sheep on range	22.7 lbs.	25 "	8.8 lbs.
" on hay	425 "	8.9 "	2 "
Salt: cattle 18 lbs. per head			
sheep $4\frac{1}{4}$ lbs. per head			

4. Seeding rates per acre;

	<u>Irrigated</u>	<u>Dry land</u>
Barley	100 lbs.	50 lbs.
Oats	100 "	50 "
Wheat	100 "	40 "
Potatoes	800 "	400 "

5. Sale and purchase prices, per unit:

	<u>Sale price</u>	<u>Purchase price</u>
Lambs (incl. old ewes)	\$8.00 cwt.	
Beef	6.75 "	
Hogs	7.00 "	
Butterfat	.28 lb.	
Wool	.22 "	
Hay, all kinds	5.00 ton	\$6.00 ton
Grain, all kinds	1.00 cwt.	1.50 cwt.
Potatoes	1.00 "	
Cottonseed cake		40.00 ton
Salt		15.00 "

6. Miscellaneous cost factors:

Wages - month men \$55 mo., day men \$2 day, herders \$70 mo.
(all prices include allowance for board).

Threshing - oats 12¢ cwt., barley 10¢ cwt., wheat 10¢ cwt.

Shearing sheep, including sacks, twine, paint, etc., 20¢
per head, all sheep.

Misc. cash costs - \$2 per crop acre.

Taxes - irrigated crop and pasture land \$30 valuation, .03¢
rate, \$.90 tax; dry crop land \$10 valuation, 30¢
rate; grazing land \$2.66 valuation, .03 rate, \$.08
tax per acre.

Horses tax per head, \$1.00

Cattle " " " .75

Sheep " " " .15

Bulls - 22 cows per bull, 2½ years service per bull, \$125
cost, or \$50 per year for 22 cows.

Bucks - 40 ewes (and yearling ewes) per buck, 2 years
service per buck, \$22 cost per buck, or \$11 per
year for 40 ewes.

7.

7. Household consumption;

Entire production 1 cow, 50 chickens, and garden;
3 hogs weighing 200 lbs. live each, 20 cwt. potatoes,
sell 80 percent potatoes above seed and home.

8. Operator's labor excluding board \$50 per month, or \$600 per year, except on the more profitable farms, where \$900 or \$1800 was used.

Methods used in calculating farm and ranch budgets,
Yampa River drainage, Colorado

1. Average yields per acre for entire area were used, and also average rates of production for livestock, although it was recognized that considerable variations in rates of production existed.
2. It was assumed that the farm raised its own seed and breeding stock; where these were purchased, sales would be increased by a like quantity, though possibly not by the same value.
3. Each farm, but not sheep range outfits, was set up with a family cow and 50 chickens, to produce for home use, and one sow was kept, and 5 hogs raised, 3 of which were consumed at home and 2 sold.
4. Crops and livestock sold were valued at long-time average prices, as these have prevailed in the past.
5. Wages, threshing charges and shearing costs were determined by the survey made in 1936. Feeds per head were partly estimated from experience in other areas.
6. Tax charges were taken as an approximate average of recent years.
7. Miscellaneous cash costs were taken at \$2.00 per crop acre, and include machinery and building cost, auto or truck cost, telephones, insurance, and miscellaneous expenses. These did not provide for autos or trucks on small farms, nor for tractors on any farms.
8. Receipts less expense is difference between value of products sold and operating costs. This is the sum which is available for family living, for paying interest and debts, and for saving. In addition, the farm family has a dwelling and some farm raised food, to add to their living.
9. Operator's wages were set at going prices (approximately) for farm labor, except that where a smaller sum than this was available to pay wages, the operator got the entire balance. In such cases, nothing was available with which to pay interest, and the property was considered to have no value.

10. Out of the return on investment, enough money was deducted to pay 5 percent interest on an estimated investment in livestock, machinery, and other capital, except land and buildings. The remainder was capitalized at 5 percent interest, to determine the total value of land and buildings on which 5 percent return could be earned. This was apportioned to different classes of land on the basis of assessed valuation of each class of land. This total value was divided by the number of acres, to get a value per acre for each class of land.

11. All livestock outfits were calculated on the basis of ownership of all spring-summer-fall grazing land. If Forest permit is available, this will lower costs somewhat, and allow the income for land to be applied to a smaller number of acres. Winter range was largely on public domain, but it was assumed two sections of school lands were leased for each band of sheep operated, at an annual total cost of \$200, and that sheep grazing fees of 1 cent per head per month were paid.

Table 7.- Form to be used in calculating values of ranch
lands based upon production of sheep or cattle

	Line	Cattle	Sheep
Number of head first of year	1		
Number of head sold	2		
Total pounds of sales	3		
Net receipts from sales	4		
Total ranch expenses, including value of operator's labor, and depreciation, but excluding interest.	5		
Differences or net ranch earnings	6		
Investment in cattle, sheep, horses and farm equipment	7		
Interest at 5 percent on this invest- ment	8		
Net earnings available for return on real estate (line 6 less line 8) <u>1/</u>	9		
Ranch earnings per head first of year (line 9 divided by line 1)	10		
Ranch earnings per head per month (1/12 of line 7)	11		
Acres grazing land per head per month	12		
Ranch earnings per acre grazing land (line 11 divided by line 12)	13		
Equivalent value per acre (line 13 di- vided by 5 then multiplied by 100) <u>1/</u>	14		
Repeat calculations of lines 12)	15		
to 14 incl. separately for each)	16		
class of grazing land)	17		

1/ Having made this analysis, one should ask himself the
question, is this a normal or an exceptional value?
A similar record over a period of years would be best.

IV. THE RANGE SITUATION

HISTORICAL BACKGROUND

Cattle

When the White River and Routt Forests were established in 1891 and 1905, cattle was the only class of stock in northwestern Colorado. The cattle industry was still dominated by the steer outfits whose principal summer ranges were in the foothills largely outside of the present forest boundaries. While exact figures have not been obtained, there were extensive areas of public domain in the Yampa River valley when the forests were created. These foothill ranges outside of the forests were used by the cattlemen in preference to forest ranges because the ranges were, and still are, better adapted to cattle use than the higher, rougher ranges in the mountains. In fact, as late as 1909, cattlemen considered the high mountain ranges worthless for cattle grazing, as is indicated by the following quotation from the 1910 annual grazing report for the Routt Forest:

"The high ranges which have been proven useless as cattle ranges on account of the short season, early snows and flies, are of little benefit to anyone and some practical use of the forage crop which now goes to waste should be made."

The following statistics reflect the condition in connection with the early day use of range in the Routt National Forest:

Numbers of Livestock Permitted on the Routt National Forest

(Entire forest area included)

Year	Permitted Stock		Unused Range (1)
	Cattle	Sheep	
1906	12,989	None	40,000
1907	24,245	"	30,000
1908	38,512	10,000	15,000
1909	34,070	15,000	19,000
1910	25,297	57,500	10,000
1911	17,424	39,700	30,750
1912	30,204	49,875	30,000
1913	30,164	52,993	31,272
1914	34,647	66,495	29,410
1915	32,956	64,270	27,996
1916	29,254	65,304	22,030
1917	28,922	101,367	-
1918	31,776	102,520	-
1919	29,303	101,365	-
1920	28,668	99,899	-
1921	23,791	99,090	-
1922	22,768	100,577	-
1923	19,300	95,850	-
1924	17,706	91,407	-
1925	13,909	110,941	-
1926	13,890	111,852	-

(1) Expressed in terms of number of cattle.

A point in connection with Table 2, which warrants strong emphasis, is the fact that much of the range used by permitted cattle up to 1919 was in foothill areas then in the forest, but later eliminated. These eliminations account for some of the fluctuations in the foregoing table. In 1910, fifty-four sections of land in the Little Snake River drainage, forty-six sections north of Hayden, forty-one sections on Elk River and sixteen sections south of Toponas were eliminated in order that the land might be made available for the home builder. In 1916, an additional thirty-two sections on the Elk River drainage were eliminated. In 1918 again, 129 sections on the Little Snake River drainage and nine sections on Morrison Creek were made subject to the homestead laws. The last elimination of lands from the Routt Forest was in 1923, when four more sections on the Little Snake River drainage were dropped. The entire area eliminated probably carried around 14,000 cattle as then stocked.

The cattlemen generally favored these eliminations, which were comprised of the lower ranges fairly well suited to cattle use. Practically all of these lands passed to private ownership, mainly under the "640 law," and are now owned or leased by sheepmen. Very few permanent homes were developed as a result of the eliminations. The lands have now very largely passed into the hands of sheepmen, with corresponding reductions in numbers of cattle.

It has been difficult to trace accurately the trend in numbers of cattle in Routt and Moffat Counties for past years. In recent years, numbers reached a peak in 1918, with nearly 90,000 in the two counties. In Routt County, the number held steady until 1923; while in Moffat County, cattle were reduced to less than 19,000 in 1921 with a slight increase in 1923. Beginning in 1924, numbers were rapidly reduced until in 1928, only 37,000 cattle were assessed in the two counties. Since 1928, there has been an increase, until now, there are about 48,000 cattle in the two counties. The more favorable financial position of sheep has been the largest single factor in the reduction of the cattle population.

Sheep

It has been mentioned that cattle was the only class of livestock in northwestern Colorado until in comparatively recent years. Two of the first bands of sheep were brought into the country in 1895. These were removed after a few days on the range, in the face of a threatened range war. In 1901, a second attempt to establish sheep on the range resulted in failure.

Meanwhile, in southwestern Wyoming, sheep had replaced cattle on many ranges. This was due to the ability of sheep to better withstand winters on the open range, to the inclination of the sheepmen to purchase range lands, mostly alternate sections in the Union Pacific grant, and thus control winter ranges, and to the weakened position of the cowman as the result of losses.

Numbers of sheep in southwestern Wyoming increased on the basis of available feed on the winter ranges. This resulted in almost unbelievable overstocking of the limited summer ranges adjacent to the vast area of winter ranges in the Red Desert territory. Conditions on the Hayden Forest (now a part of the Medicine Bow Forest) at the time it was established are indicative of the degree to which the summer ranges were overstocked. In 1906, grazing permits were issued to sheepmen on a "prior use" basis, for slightly more than 300,000 head of sheep. On the same range, permits were issued for approximately 42,000 sheep in 1935, and the range is still overstocked.

The excessive overstocking of the old Hayden called for some application of heroic remedies. Numbers had to be reduced by preference cuts or by transfer to other summer ranges. The unused range on the Routt, heretofore mentioned, seemed to offer possibilities for relieving the critical conditions on the Hayden without injuring ranchmen adjacent to the Routt Forest. In this connection, the following is quoted from one of the early grazing reports made by the Supervisor of the Routt Forest: "Owing to the inability or disinclination of the residents of Colorado to procure sheep, except in two instances, there is a great deal of fine sheep range wasted each year...This question has been discussed with each settler along the route and without a single exception they are in favor of allowing sheep to use the range."

The matter came to a head in January 1908, with a joint meeting at Baggs, Wyoming, of the advisory boards of the Snake River Stock Growers Association of Colorado and the Carbon County Wool Growers Association of Wyoming. An agreement reached at this meeting resulted in opening to Wyoming sheep certain ranges in the Routt National Forest. A copy of the agreement is included in the Appendix.

After the agreement was reached, the Forest Service, in 1908, authorized the use by 10,000 sheep of an area in the vicinity of Whiskey Park on the Routt Forest. Subsequently, other Routt ranges were opened to Wyoming sheep from the overstocked Hayden ranges. The extent to which the Wyoming sheep were moved from the Hayden has been shown in a preceding table. The numbers increased from 10,000 in 1908 to about 98,000 in 1918.

In allotting the Routt ranges to the Wyoming sheep, the carrying capacity of the ranges was overestimated. Through the years this resulted in numerous shifts and adjustments in allotments, and also necessitated reductions in preferences. Through the years, reductions of all kinds on Wyoming sheep preferences using range on the Routt Forest amounted to 39,904 head of sheep. The question is often asked, "What was done with the surplus range gained through these reductions?" The reductions were used almost entirely for range protection and the Routt Forest range now occupied by Wyoming sheep is practically the same area as was used by them in 1918.

A portion of the White River Forest was first classified as sheep range in 1911. Due to lack of demand, sheep were not grazed on the area until 1916. In fact, demand for sheep range on either the Routt or White River Forests from Colorado ranches did not develop until about 1924. Many ranges, both inside and outside the forests, formerly occupied by cattle were vacant about that time as a result

of business failures and adjustments after the World War. Sheep were, and still are, in a more favorable position from the standpoint of financial returns. For this reason numbers have increased steadily since 1924, until in 1935, there were 285 owners with 318,653 sheep on all ranges in the Yampa River drainage. A large proportion of the sheep admitted to forest ranges subsequent to 1924 gained permits through purchase of old cattle outfits with waiver of grazing privileges.

SEASONAL RANGES

The use of ranges at different seasons of the year is fundamentally governed by the limitations imposed by climate at various altitudes, and the related development of forage. The seasonal ranges thus blend into each other and use may change from year to year with varying climatic conditions. The availability of water, particularly on the lower ranges, is also a factor which affects seasonal use. It is therefore impossible, in describing the ranges or in compiling statistics for an area as large and varied as the Yampa River drainage, to make clean-cut divisions of seasonal range use. Seasonal range data have necessarily been based on approximate divisions of the area as indicated by climatic conditions and known use. The approximate division used in compiling data for this report is shown on an accompanying map.

North of Yampa River, the principal summer ranges lie east of Fortification and Willow Creeks or east of R. 91 W. South of Yampa River this line also marks in a general way the west boundary of the summer range. In addition, on the south side of the river, T. 5 N., R. 91 and 92 W., and all of the land south of the north line of T. 4 N. is used for summer range. This large area, while essentially summer range in character, includes many small tracts of range which could not be isolated, and which are used by both cattle and sheep during the spring and fall.

Map No. 2 shows the use of ranges by sheep in 1935. Sheep use, rather than cattle use, was selected for detailed analysis because fewer operators are represented. Consequently, fairly complete information could be obtained more readily. On the map are shown the areas known to have been used by sheep for summer and winter range. The use was divided between only summer and winter because it was next to impossible to obtain complete information concerning the movement of sheep during the spring and the fall. The map also shows the type of operation (winter range or hay feeding) and the locality (Colorado, Wyoming or Utah) which was the principal base or headquarters of the operator.

Within the forests the uncolored portions of the map designate ranges used exclusively by cattle. The same is true of some of the areas which have been described as summer range outside of the forests, but there was also additional use in many instances by sheep in the spring or fall, or use incidental to trailing.

The topography of this main area of summer range varies from the extremely rough and broken terrain of the higher areas to the gentle even slopes commonly found at its lower limits. Typically, the summer range includes the area of higher elevations, greatest annual precipitation and greatest snowfall, shorter growing seasons, permanent streams, staple soils and optimum growing conditions for the more hardy native plants capable of maturing in a short season.

Plant cover types include alpine grassland, sub-alpine conifer and aspen timber, wet meadows, mountain brushland and sagebrush.

Immediately west of the summer range area are ranges used mainly in the spring and fall, but interspersed throughout the extreme western section are comparatively small tracts of range used during the summer by both classes of livestock. A rather large number of sheep are lambled in or trailed across these ranges in the spring, particularly the Great Divide region. Sheep again cross this area in the fall. In addition, there is considerable use of the Great Divide territory during the spring and fall by cattle from ranches on Fortification, Four Mile and Willow Creeks, and from the valley of the Little Snake River. Smaller herds of cattle, owned by local farmers, use the Great Divide ranges yearlong with supplemental hay feeding in the winter.

Characteristic of the topography of the spring range are rolling plateau lands and foothill areas which lie at elevations varying from 5,500 to 7,000 feet above sea level. While a few permanent streams traverse this area, most of the water courses are ephemeral in character and livestock water is but indifferently well distributed. Characteristic of the spring-fall ranges are short growing seasons, intermittent streams, loose easily eroded soils and variable growing conditions limited by an annual precipitation of from ten to sixteen inches. The major native plant cover types are sagebrush and pinon-juniper woodland, but minor areas of mountain brushland, greasewood and shadscale are included.

West of Great Divide and Little Snake River are the winter ^{summer} sheep ranges. Absence of water practically precludes any use of these typical winter ranges.

The topography of the winter range is featured by broken bench-lands and bottoms at an altitudinal range between 5,000 and 6,500 feet. Typical of the winter range are the lowest elevations within the unit, an annual precipitation of less than ten inches, intermittent streams or none at all, loose and easily eroded alkaline soils, and growing conditions suited only to the desert or semi-desert types of vegetation. The major plant cover types represented are shadscale, pinon-juniper woodland and sagebrush and greasewood.

AREA AND OWNERSHIP OF SEASONAL RANGES 1/

The area and ownership of seasonal ranges are shown below. The divisions are approximate because, as has been stated, clean-cut segregations are impossible.

Ownership	Summer		Spring-Fall		Winter		Total
	Range	%	Range	%	Range	%	
Private	811,577	40	607,214	40	30,150	5	1,448,941
State	95,173	5	149,696	10	36,295	6	281,164
Public Domain ^(a)	381,462	18	766,718	50	513,441	89	1,661,621
National Forest	745,348	35	0	0	0	0	745,348
Total	2,033,560	100	1,523,628	100	579,886	100	4,137,074 (b)

(a) Includes all unpatented lands not in national forests in 1935.

(b) Does not include 151,187 acres of crop land.

Thirty-five per cent of all range lands in the Yampa River drainage was in private ownership in 1935; 7 per cent was the property of the State of Colorado; 18 per cent was within national forests; and 40 per cent was public domain. The term "public domain" as used here includes all lands not in private or state ownership in 1935, or in national forests. Consequently, an unknown number and area of unperfected entries are included. Some of these will ultimately pass to patent thus increasing the area of privately owned range and reducing the area of public domain.

Forty-nine per cent of the area of all range land in the Yampa River drainage, as classified in the foregoing table, is summer range; 37 per cent is spring-fall range; and 14 per cent is winter range.

1/ More detailed statistics will be found in the Appendix.

PRESENT NUMBERS OF LIVESTOCK USING THE RANGE

Estimates of the number of cattle and horses in the Yampa River area are based on the records of the county assessors. Sheep statistics are based on shearing counts made by county assessors, on numbers under national forest grazing permits, on information obtained through interviews with sheepmen, and on statements made by stockmen in applying for Taylor Grazing Act licenses.

The estimated livestock and big game populations in 1935 are as follows:

Cattle, Horses and Big Game

(Number of Animals)

Class	:Routt : :County :	Moffat : County :	Rio Blanco : County :	Total :
Range Cattle (Owners)	: 22,181 ^(a) :	10,596 ^(b) :	1,985 :	34,762 :
Range Cattle (Lessees)	: 7,947 :	3,546 :	0 :	11,493 :
Dairy Cattle (Owners)	: 1,770 :	1,000 :	29 :	2,799 :
Dairy Cattle (Lessees)	: 1,116 :	610 :	0 :	1,726 :
Horses	: 5,578 :	5,968 :	229 :	11,775 :
Wild Horses	: 0 :	2,000 ^(c) :	0 :	2,000 :
Deer	: 1,000 :	2,500 ^(d) :	0 ^(e) :	3,500 :
Elk	: 1,100 :	500 :	0 ^(f) :	1,600 :
Mountain Sheep	: 0 :	100 :	0 :	100 :
Antelope	: 0 :	500 :	0 :	500 :

- (a) In addition, Moffat County cattle, equivalent to 2,888 cow months' use, were in Routt County part time.
(b) In addition, 3,102 cattle were in county part time. Use amounts to 17,431 cow months.
(c) Estimated from data furnished by riders.
(d) Included in Moffat County numbers.
(e) An additional 1,000 deer moved into the winter ranges from outside the unit.
(f) An additional 4,500 antelope moved into the winter ranges from Wyoming, according to estimates made by Mr. McFarland, of the Biological Survey.

TABLE NO. 2

USE OF LANDS BY SHEEP IN 1935YAMPA RIVER DRAINAGE - COLORADO

Line No.	Range Used by Seasons					Number	Number
						Owners	Sheep
	Summer						
	Winter						
(1)	Roan National Forest				Colorado hay ranch	36	17,527
(2)	"	"	"		Wyoming winter range	18	69,735
(3)	"	"	"		Taylor District No. 1 (Yampa River)	1	1,250
(4)	"	"	"		Taylor District No. 6 (Yampa River)	7	15,073
(5)	White River National Forest				Colorado hay ranch	11	10,717
(6)	"	"	"	"	Utah	1	2,500
(7)	"	"	"	"	Colorado winter range (Not Yampa River)	4	3,750
(8)	"	"	"	"	Taylor District No. 1 (Yampa River)	6	11,000
(9)	"	"	"	"	Taylor District No. 6 (Yampa River)	2	6,250
(10)	Colorado Owned and Leased Lands				Utah	24	42,142
(11)	"	"	"	"	Wyoming	6	26,600
(12)	"	"	"	"	Colorado winter range (Not Yampa River)	9	22,251
(13)	"	"	"	"	Taylor District No. 1 (Yampa River)	5	1,253
(14)	"	"	"	"	Taylor District No. 6 (Yampa River)	12	35,607
(15)	"	"	"	"	Colorado hay ranch (Inside Dep. Zone)	68	12,484
(16)	"	"	"	"	" " " (Outside Dep. Zone)	19	1,061
(17)	Small Tenant Farmer Group				" " " (Inside Dep. Zone)	18	1,239
(18)	"	"	"	"	" " " (Outside Dep. Zone)	30	2,720
(19)	Utah				Taylor District No. 1 (Yampa River)	1	1,200
(20)	"				Taylor District No. 6 (Yampa River)	4	18,538
(21)	Wyoming				Taylor District No. 6 (Yampa River)	2	6,500
(22)	Colorado - Outside Yampa River				Taylor District No. 6 (Yampa River)	1	3,687
	Total					285	318,690

Note: Numbers reported as summering on national forests indicate actual use under all forms of permits.
 For statistics concerning pay permits by size classes, see Table No. 1, Section 1.

The distribution of range cattle on summer ranges in 1935 is shown in this tabulation:

Range Cattle - Number of Animals

Summer Range	: Routt : County	: Moffat : County	: Rio Blanco : County	: Total
Routt Forest (a)	: 5,732	: 1,450	: 0	: 7,182
White River Forest (a)	: 4,287	: 142	: 1,975	: 6,404
Other lands	: 20,109	: 12,550	: 10	: 32,669
Total Range Cattle	: 30,128	: 14,142	: 1,985	: 46,255

(a) Estimated actual use. See Table No. 1, Section I, for grazing permit numbers.

Eleven per cent of the range cattle in Moffat County grazed on national forests during the summer of 1935; the ratio for Routt County was 34 per cent, and for the entire unit 29 per cent. Only a small portion of Rio Blanco County is within the area studied.

Turning now to sheep, the use of lands in the Yampa River drainage in 1935 by this class of livestock is shown by Table No. 2. It was found to be impracticable to report the sheep population by counties, due to inter-county and inter-state movements of flocks.

All of the sheep (318,690) which were in the Yampa River drainage any part of the year were counted in compiling Table No. 2. Of the total number, 19,738 used summer range in Utah, 6,500 summered in Wyoming and 3,687 were on summer ranges in Colorado, outside of the Yampa River drainage. Thus, 29,925 sheep moved over long distances from outside summer ranges into the Yampa River drainage to winter. This reduced the number of sheep which used summer range within the study unit to 288,765, distributed as follows:

<u>Summer Range</u>	<u>Number Sheep</u>	<u>Per Cent</u>
Routt National Forest	104,185	36
White River National Forest	39,217	14
Other Summer Ranges	<u>145,363</u>	<u>50</u>
Total	288,765	100

The prevailing practice of moving sheep long distances is again in evidence as we consider the distribution during the winter, of the 288,765 sheep which summered within the unit. Of this number, 171,978, or 62 per cent, moved to winter quarters outside of the Yampa River drainage. To Wyoming went 96,335; to Utah, 44,642; and to winter ranges south of the Yampa River unit in Colorado went 31,000 sheep. Remaining in the Yampa River unit for the winter were 116,787 sheep. To this number must be added the 29,925 sheep which summered in Utah and on other ranges outside of the Yampa River unit and which were moved into the area in the fall, making a net total of 146,712 sheep in the Yampa River drainage during the winter. These sheep were distributed as follows:

<u>Location</u>	<u>Number Sheep</u>	<u>Per Cent</u>
Hay Ranches	45,754	31
Taylor District No. 6	86,255	59
Taylor District No. 1 (a)	<u>14,703</u>	<u>10</u>
Total	146,712	100

(a) Only that portion of Taylor District No. 1 which lies within the Yampa River drainage is included in this study.

The distribution of sheep during the summer and winter is also shown on Charts No. 4 and 5. The percentages indicated on these charts are based on the entire number of sheep (318,690) which were in the study unit any part of the year.

(1) Summing up the sheep situation, as concerns number of animals, we find that trailing large numbers for long distances characterized the use in 1935. The inter-state movement of sheep was an appreciable factor. To and from winter ranges in Utah to summer ranges in Colorado came twenty-four owners with 44,642 sheep and to and from Wyoming came twenty-four owners with 96,335 sheep. Two trips were made to and from summer ranges in Utah by five owners with 19,738 sheep and from Wyoming summer ranges came two owners with 6,500 sheep. The statistics on inter-state movements include all sheep which were moved across state line regardless of the length of time in any state. Some flocks moved into Utah for only one month and then returned to Colorado. The movement of sheep between summer and winter ranges in Colorado is also over long distances.

Trailing of livestock cannot be avoided. It does, however, contribute materially to range deterioration and ought to be held to the necessary minimum by planned range use.

(2) In summing up, we might also mention the so-called "transient" group. There is no clean-cut division between the transient and permanent livestock operator. The transient often establishes himself ultimately on a more or less permanent basis. Usually the term is applied to stockmen operating on public range and leased lands, with little actual ownership of local property. With this viewpoint the following groups might be segregated from Table No. 2 as representing the use of range by transients in 1935:

<u>Line Number</u>	<u>Number of Owners</u>	<u>Number of Sheep</u>
10	24	42,142
11	3	16,000
12	9	22,251
13	<u>5</u>	<u>1,253</u>
Total	41	81,646

Most of the Wyoming sheepmen own large blocks of winter range and have operated consistently over a long period of years. The authors do not consider such sheepmen as transients.

(3) The practice of wintering sheep on hay was followed by 182 owners. This number represents 64 per cent of all sheepmen, but these operators owned only 14.3 per cent of all sheep which used range in the unit during the year. Their sheep, however, represented 31 per cent of the number which wintered within the unit. This group includes small flocks on Moffat County ranches where very little hay is produced and fed.

(4) In order to show the combined use of range by all animals (including domestic livestock and big game), it is necessary to convert to a common factor, such as use by one cow for one month--the cow month unit. When all of the 1935 use by grazing animals is converted to this common unit, the total equals 970,253 cow months. This use of range lands by seasons and by classes of ranch ownership is given below and is pictured graphically by Chart No. 6.

1935 Use of Range Lands (a) By All Classes of Range Animals

Cow Months (b)

Seasonal Range	Federal Ownership				Total
	Private	State	Public	National	
			Domain	Forests	
Summer	282,920	34,750	132,499	183,843	634,012
Spring-Fall	67,855	23,582	116,503	0	207,940
Winter	6,283	769	113,583	0	120,635
Total	357,058	59,101	362,585	183,843	962,587

(a) Does not include hay, grain, crop aftermath or concentrates.

(b) The bases for all conversions used in this report will be found in the Appendix.

When the use of hay, grain and crop aftermath (i.e. meadow and grain stubble) are included in the forage resource, the total use in 1935 becomes 1,372,560 cow months. The table below summarizes the use of the entire forage resources.

Summary of Total Use of Forage Resources

Cow Months - 1935

Class of Feed or Forage	Seasons			Total
	Summer	Spring-Fall	Winter	
Pasture Lands	634,012	207,940	120,635	962,587
Hay and Grains	0	0	365,649	365,649
Crop Aftermath	0	44,324	0	44,324
Total	634,012	252,264	486,284	1,372,560

Seventy per cent of all feed was supplied by natural forage; 26 per cent by hay and grains; and 4 per cent by crop aftermath.

It should be borne in mind that the foregoing statistics are based on an estimate of actual use in 1935. The subject of range capacity is discussed elsewhere.

PRESENT CONDITION OF THE RANGE

National Forest Summer Range

In general the forest range is in very good condition. There are, however, certain evidences of past local overgrazing, such as the thinned grass cover and advance of *Wyethia* (rosinweed) and sagebrush in California Park; the relative abundance of unpalatable annual weeds on cattle ranges north of Rabbit Ears Pass and near Columbine; and the encroachment of sagebrush and a thinned grass cover around the margins of some of the parks, as Big and Little Red Parks. In every case, such damage bears evidence of having been caused by localized concentration of stock, principally cattle, at some time in the past. There is no evidence that this damage is accelerating at the present time.

Sheep ranges are in very good condition. The basis for this statement is that the principal highly palatable feeds such as cow parsnip (*Heracleum*) brome grasses, and to a lesser extent various mints and other herbs, while intensively grazed, are abundant and are not being replaced by less palatable species. The less palatable plants, while fairly abundant in the natural association, are not grazed to any great extent, indicating an adequate supply of valuable forage.

The condition of these ranges, as evidenced by 1936 inspections, supports the estimated carrying capacities and the proportion of actual stocking to proper stocking as given elsewhere in this section. The present rate of stocking is considered about proper for sheep. It is likely that on certain ranges which are used by cattle at present, relatively more sheep could be grazed. There is a possibility that some cattle could be shifted to other grassy areas somewhat better suited for cattle. The number of animal units of stock may be expected to remain about the same, however.

Outside Summer Ranges

These ranges are in relatively good condition. Soil and moisture are favorable. Ranges which were repeatedly overgrazed and had deteriorated have come back rapidly, when stocked at about the same rate as the national forests, according to one sheepman who claims to have rehabilitated some summer range. Some of the grassy parks contain considerable quantities of daisy (*Erigeron*) and stickseed (*Lappula*) as compared with similar forest ranges. Since these ranges have been used by cattle until very recently and since these plants are unpalatable to cattle especially, it may be inferred that some deterioration of the range has taken place due to cattle use.

In certain portions of the mountain brush types, the increasing abundance of bracken fern may be taken as indicative of range deterioration. This encroachment of fern appears to be due to excessive sheep grazing, since it is taking place on some steep slopes which probably were never heavily grazed by cattle. However, in these same areas, bracken fern is a part of the normal plant composition.

In the foothill area, especially north of Hayden, thousands of acres have gone over almost entirely to rosinweed (*Wyethia*) and more limited areas to sneezeweed (*Helenium*), or a combination of the two. It is asserted by stockmen that *Wyethia* has taken the range following heavy concentration of cattle on certain holding grounds and trails. There appears to be substantiation to the belief that after *Wyethia* is established, the seeds are widely spread by adhering to the wool of sheep. This weed is practically worthless for grazing purposes. Its dense habit crowds out competing vegetation, and the fact that the plant dries up about midsummer leaves the soil bare and exposed to erosion. Wherever *Wyethia* secures a firm foothold, other plants are practically eliminated and the range capacity declines sharply.

On some of the drier areas sagebrush has increased tremendously and has crowded out a certain amount of palatable grasses and weeds. While sagebrush protects the soil to some extent, the reduction in palatable plants has caused the value of the range to drop; and a combination of grass and sagebrush is a better soil protection than sagebrush alone.

Spring-Fall Ranges

The condition of this area is covered in a statement by Dr. David Costello, and included in this report. The following supporting and supplemental observations may be made, however. These ranges, while primarily adapted to spring-fall use, are also used by both cattle and sheep to some extent throughout the year. They are largely sagebrush in character. Grasses, such as rice grass (*Oryzopsis*) and bluestem (*Agropyron smithii*) which were fairly abundant at one time, have been largely eliminated or reduced to scattered, weakened specimens. Sagebrush makes up the bulk of the forage and over-use of this plant is indicated by mile after mile of sage hedged down to the hard, woody stems with very little annual growth and only a few short flower stalks showing.

As pointed out in the following pages, the thinning of the vegetation, especially of the grasses, has the effect of increasing run-off, compacting the soil, reducing absorption and increasing the leaching of humus and minerals out of the topsoil.

While protected areas, indicating what the vegetative composition once was, are rare, it seems certain that a very severe reduction in the amount of valuable forage has been caused by excessive grazing.

Winter Ranges

Both the Wyoming and Colorado salt-bush types are characterized by shrubs which have been hedged down to the woody stems. On considerable areas, such as the one north of Sparks, shadscale plants were either killed or grazed to such an extent that only one or two twigs formed green leaves.

Over great areas, rice grass has been killed out, as evidenced by dead crowns or weakened to a condition where only one or two weak stalks are formed.

The following statements by Dr. Costello and Mr. Connaughton on range conditions and soil erosion were submitted as a result of individual studies and observations, both in the Yampa River area and in the Wyoming desert.

Range Forage Trends ^{1/}

The principal range types found in Moffat, Rio Blanco, and Garfield Counties, outside the national forests, are greasewood and shadscale (winter range); sagebrush, pinon-juniper, and chaparral (spring-fall range); and chaparral and aspen (summer range). Practically all of these types have been subject to improper grazing use in the past and show evidences of reduced carrying capacity.

An extensive forage survey of this region in the summer of 1936 indicates that over 70 per cent of the localities in which sample plots were taken show appreciable deterioration of the forage resource and slightly less than 30 per cent show relatively stable conditions. There was no instance recorded where the range appeared to be appreciably improving. These indications were based on various types of evidence, such as thinning of the cover; preponderance of annual plants and unpalatable species; high mortality of the more palatable shrubs; invasion of unpalatable species as evidenced by the presence of *Gutierrezia*, *Chrysothamnus* and *Opuntia* seedlings; plants growing on pedestals, especially in areas where sheet and wind erosion had removed the topsoil; and the excessive use of shrubs of low palatability by all classes of livestock.

A palatability classification of range forage species found in the different vegetative types is shown in the following table:

^{1/} Prepared by Dr. David F. Costello, Rocky Mountain Forest and Range Experiment Station.

Palatability Classification of Forage Species
Found in Northwestern Colorado

Type	Per cent of species in each type with		
	Low palatability (0-15%)	Medium palatability (20-45%)	Good palatability (50% & above)
Greasewood	48.6	37.1	14.3
Shadscale	50.0	30.3	19.7
Sagebrush	66.1	16.5	17.4
Pinon-juniper	64.1	12.6	23.3
Chaparral	58.0	23.0	19.0
Aspen	48.4	27.4	24.2

The large percentage of species in the low and medium palatability classes is readily apparent. Further analysis of these data show that these low palatability species are mostly annuals or obnoxious weeds. For example, 91.6 per cent of the weeds in the pinon-juniper type possess low palatability and only 4.6 per cent are highly palatable to cattle. In the chaparral type which is predominantly a browse type, 67 per cent of the browse species are low in palatability and only 10 per cent have the good rating. Indications for all types are that the proper proportions of poor, medium, and good species have been greatly disturbed. Lightly grazed and moderately used areas at least have a markedly greater proportion of good species than heavily grazed or severely used areas.

The proper class of livestock, as well as the proper season of use, on many of these areas would do much to improve the range and should also give a better economic return. In many instances, cattle are grazed in summer on winter ranges that are best suited to sheep. Of all the greasewood and shadscale areas examined in the recent survey, only one was noted as being used exclusively for winter range. Seven of these were used all year by cattle and horses in addition to winter use by sheep. Spring-fall ranges, principally sagebrush and pinon-juniper, show all types of actual use. Approximately 30 per cent of all spring-fall areas examined receive summer use by cattle and horses and winter use by sheep. Summer ranges have been used only during the summer period, climatic conditions making their use impracticable at other seasons of the year.

A comparison of carrying capacity figures for cattle and sheep on spring-fall and summer ranges in northwestern Colorado indicates that sheep could be grazed more profitably than cattle. Thus, the forage acre factor for the sagebrush type indicates a one-third greater carrying capacity for sheep

than cattle. Approximately the same ratio holds for the other spring-fall and the summer range types. With recuperation, however, many of these low altitude ranges should become increasingly valuable for cattle.

Under moderate use the ranges in northwestern Colorado should show an increased density, a higher proportion of valuable plants, an increased vigor of individual species, and a greater carrying capacity. The rate of stocking and the season of use should be adjusted to the extent that vigorous growth of the more important range species and their normal reproduction is possible.

Soil Erosion on the Ranges of Moffat County, Colorado ^{1/}

Normal vs. Accelerated Erosion: Any discussion of soil erosion, particularly of desert and semi-desert regions, requires a clear understanding of the distinction between the normal geologic processes of soil movement over which man has no influence and the rapid, accelerated processes which have been induced by man's activity.

Undoubtedly when man first viewed northwestern Colorado, run-off from many areas was comparatively rapid and many slopes and channels were eroding actively. These eroding areas formed natural bad lands, and contributed greatly to the silt load of the rivers and streams. For the most part, normal erosion of any appreciable magnitude and the consequent natural bad lands, was concentrated at the lower altitudes such as the breaks of the Little Snake River and its tributaries. At the higher altitudes such as the Slater and California Parks it is doubtful that normal erosion was noticeable, because even today, after years of use by man and his herds, no serious erosion is in evidence.

Even at the lower and intermediate elevations, however, thousands of acres were to be found in this county, on which normal erosion was a very slow process, the soil being held in place by virtue of a very delicate balance between the soil binding forces, mainly vegetation, and the soil transporting forces such as rainfall and slope. Obviously, since the advent of man this natural balance has been upset, and erosion has been accelerated greatly over and above its natural rate. Dust storms occur; plants that remain appear as though they were growing on pedestals of soil, the soil between the living plant clumps having been washed or blown away; gullies are present where formerly, according to geologic evidence and testimony of early

^{1/} Prepared by Charles A. Connaughton, Rocky Mountain Forest and Range Experiment Station.

sottlers, only shallow depressions existed; and natural gullies are apparently being enlarged more rapidly because of an increased rate of run-off. It is these processes of acceleration with which the range manager is concerned.

Evidence of Accelerated Erosion: Erosion at the higher altitudes in and near Moffat County is not serious. Slater Park, for example, is characterized by well vegetated slopes and willow-lined streams meandering through productive natural meadows. California Park on the Routt National Forest is not seriously eroded, but shows evidence of soil being removed at a rate slightly greater than normal.

With a slight drop in elevation, however, erosion begins to become pronounced and the soil surface shows evidence of leaching and loss of organic matter which obviously decreases soil fertility and forage production. Fairly frequently, particularly on the ranges used in the spring, erosion has been more severe in the past than at present as shown by the fact that raw gullies are being healed by the encroachment of vegetation.

In Fortification Creek very serious accelerated erosion is in evidence. The Little Snake River and tributary drainages below Baggs are suffering serious sheet erosion, channel cutting and gully formation, though in some instances old gullies seem to be healing. The rapid normal erosion along the north bank of the Little Snake River should not be confused with the erosion induced in recent years.

The Yampa River itself is an actively eroding stream from a point about twenty-five miles west of Steamboat Springs to its mouth. The mud bars and sand deposits in the lower reaches of this river at present area marked contrast to an early description of the same area given by Hayden ^{1/} who made geological surveys in this area during the years 1873 - 1876. His report says: "Like the White River, the Yampa in its upper portion is a cold trout stream, its bed being paved nearly all the way from its source to its mouth with smoothly worn drift pebbles."

Tributary drainages of the Green River, such as Vermillion Creek, are eroding greatly beyond their normal rapid rate and, even in lower water, run muddy. In the upper west portion of Vermillion Creek, on typical winter range in both Colorado and Wyoming, some of the most serious erosion in this entire locality is to be seen.

^{1/} Hayden, F. V. - Report of the U. S. Geological Survey
- Year 1876.

Channel bank configurations observed in this badly eroded winter range area clearly indicates that the present erosion is of a greatly accelerated nature.

As a matter of interest, erosion is just as prevalent and just as serious, if not more so, in the range area similar to Moffat County between the Colorado-Wyoming line and Rock Springs, Wyoming.

Consequences of Accelerated Erosion: The consequences of accelerated erosion and run-off are as obvious as they are serious. When new gullies begin to form and soil is stripped in sheets from slopes the silt load of streams is increased accordingly; the efficiency of irrigation and hydroelectric improvements is impaired; floods are more common; dust storms are prevalent; and of greatest importance to those interested in forage production the soil and soil fertility is rapidly lost.

Soil fertility which is vital to the establishment and growth of any forage plant undoubtedly merits further discussion, as this subject is of vital concern wherever range carrying capacity is to be considered. Invariably the first constituents of the soil to be lost by leaching and erosion are nitrogen and organic material, both of which are essential to satisfactory plant growth. As an illustration of this statement, studies in Idaho have shown that soils from badly eroded areas contain only 61 per cent as much nitrogen and 55 per cent as much organic matter as do soils from non-eroded areas. The effect of the diminished amount of these two important soil constituents on plant growth has been brought out by two studies in Utah. In one of these studies while only 5.5 pounds of dry plant material were being produced on a given unit of eroded soil, 12.1 pounds were produced on a similar unit of non-eroded soil.^{1/} In the other case the application of nitrogen and organic material to soils robbed of them by leaching and erosion increased production of vegetation more than fourfold.^{2/}

Loss of organic matter in the soil introduces a further element of concern inasmuch as when this sponge-like material is decreased the absorptive power of the soil is threatened, run-off is rapid and less water is retained for plant growth. The end result is that forage

^{1/} Data collected by Intermountain Forest and Range Experiment Station, Ogden, Utah.

^{2/} Stewart, George and Pittman, D. W. - 1931 - Twenty years of rotation and manuring experiments at Logan, Utah. Utah Agricultural Experiment Station Bulletin 228, 31 p.

production drops accordingly, owing to lack of soil moisture. Also when erosion and leaching of the soil have taken place, establishment or restoration of a suitable plant cover is made difficult and exceedingly slow because plants have certain soil and moisture requirements and when these drop below a given minimum, satisfactory growth is impossible. This latter situation often explains why areas from which livestock are excluded do not improve and the false conclusion is arrived at that the effects of grazing are overdrawn.

In brief, therefore, it can be stated without qualification that indications of accelerated erosion are likewise indications of decreased forage yields and decreased possibilities or rapid rehabilitation of the plant cover in general.

Summary; Inspection has shown that whereas past scars of erosion appear to be healing in portions of Moffat County and active erosion at the higher altitudes is not appreciable, the lower and intermediate altitude ranges as a whole are suffering from marked acceleration of sheet and gully erosion, the fertility of the topsoil is being lost, and serious and rapid inroads into the productivity of range are being made.

263243

Actively eroding gully on Fortification Creek. Many gullies such as this are a result of accelerated soil removal and in addition to eating into the range are serving to concentrate the run-off and cause rapid drainage of the surrounding land.

263245

Net work of gullies on Fortification Creek. These gullies undoubtedly started with a small break in the surface and at present are rapidly advancing by a process of headward erosion.

311782

Head of recently formed gully advancing through the valley floor at a comparatively rapid rate. View taken upstream.

311783

View downstream from same point the above picture was taken. This gully extends along the entire length of the draw below this point and has been cut from the formerly level valley floor within the last thirty years.

311787

On rocky, shallow soils deep arroyos cannot be formed but without sufficient protection by vegetation small gullies and sheet erosion such as shown above can readily remove what soil there is, leaving exposed a sterile, rocky substratum that cannot support a plant cover.

311778

A cover of thrifty herbaceous and shrubby plants protects the soil from the erosive effects of water and wind and builds up the supply of organic and mineral substances so essential to plant growth.

Severe sheet erosion on this shadscale type has done much to make these plants appear as though they are growing on hummocks. When plants are destroyed and the binding power of the roots gone, the soil is left to the mercy of the wind and water and the more or less porous, fertile surface soil is rapidly removed, leaving uneroded only those places where a plant has been able to survive.

Severely overgrazed sagebrush range south of Sparks. Note the hedged appearance of the sagebrush and manner in which the clumps seem to be growing on pedestals of soil. Undoubtedly sheet erosion is the major cause of this pedestal formation as the intervening soil, not protected by sagebrush, has been washed or blown away.

View taken during summer rainstorm north of Baggs, Wyoming, showing how on denuded range the water collects on the surface and rapidly runs off, removing soil in sheets or forming gullies where the soil is deep enough and the flow is concentrated sufficiently.

CARRYING CAPACITY

The yearlong carrying capacity of the entire Yampa River drainage will be discussed to show the relationship between present stocking and distribution plans. In discussing the area from the standpoint of the number of livestock which can be supported, the term "carrying capacity" is used. The meaning of carrying capacity frequently depends upon individual viewpoint. A ranch producing 200 tons of hay may be said to have a winter capacity for 100 head of cattle, based on average feeding practices. The stockman who plans to carry his stock through the winter in the best possible condition might say the capacity of the same ranch is only 150 cattle, while the one who feeds scant rations might argue the capacity is ample for 250 cattle.

Similarly with range capacities; and in addition, the more complicated and less understood factor of the effect of grazing on plant composition and soils is introduced. Range capacity may be determined on the basis of utilizing any given proportion of the available forage; on the basis of maintaining a stated plant composition or density; on the basis of normal, sub-normal or abnormal precipitation; or on the basis of supplemental feeding of concentrates; and so on. Probably the best method of determining the carrying capacity of a range is to compare actual use over a period of years and condition of the forage with a standard predicated on maintaining the forage resource in a state of maximum production. In the absence of accurate information on past use, approximate capacities may be determined by range surveys which include analysis of the forage on an area. Since different methods were used in this study, the basis for capacity estimates will be stated.

In the Yampa River drainage there are feed resources of two classes: (1) Hay and grain produced on cultivated lands and stored for winter feeding; and (2) natural plants produced on grazing lands and harvested by livestock at varying seasons depending upon climatic condition.

In determining the production of cultivated feed crops, the yields reported by the United States Bureau of Census were used to compute average yields. The reported yields were adjusted to a ten-year (1920-1929) average by applying certain adjustments indicated in the estimates made by the Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics, United States Department of Agriculture. Average production was then determined by multiplying average yields by average crop acreages. The results of these computations indicate an average production of hay in the Yampa River drainage as follows:

Average Hay Production in Tons

Class	: Routt	: Moffat	: Rio Blanco	:	Total
	: County	: County	: County	:	
Timothy-clover	: 68,193	: 7,470	: 4,478	:	80,141
Alfalfa	: 13,901	: 20,564	: 396	:	34,861
Native hay	: 1,612	: 3,786	: 54	:	5,452
Grain hay	: 4,495	: 5,610	: 124	:	10,229
Total	: 88,201	: 37,430	: 5,052	:	130,683

Tons of hay were expressed in carrying capacity by using 800 pounds of hay per cow month as the average feeding requirement for all classes of animals converted to a cow month unit. This figure seems to reflect actual feeding practices for the Yampa Valley, although individual stockmen may feed less.

The indications were less clear when grains were considered. Grains, in this area, are produced as two-way crops. That is to say, when grain prices are high, more grain reaches cash markets; when the prices are low, more is fed on the ranch. Some of the production is always fed to hogs and poultry. After making allowance for these factors the remainder of the average grain production was considered to be available for local feeding of livestock. The winter carrying capacity of the area was thereby increased. (See the Appendix for details of method used.)

The following capacity values of crop aftermath were used: (1) Hay meadow stubble - 1.8 acres per cow month. Alfalfa stubble was not included because this crop is infrequently used for pasture; (2) grain stubble - 8 acres per cow month. This value was determined on the basis that 20 acres of grain stubble equals one ton of hay; (3) fallow lands were given no value; (4) a value of 4.2 acres per cow month was arbitrarily assigned to crop failure lands.

The estimated capacities of national forest lands were determined from grazing survey data checked against years of known actual use and condition of the range. The usable range (dense timber and other waste areas excluded) was assigned a capacity of 3.8 surface acres per cow month.

Privately owned, state owned and public domain summer ranges were assigned an average capacity of one cow month to 4.2 surface acres. This value was determined through the analysis of the forage on a limited number of sample range plots and by comparison with national forest ranges.

Spring and fall grazing lands in all ownership were assigned a capacity of one cow month to 13 surface acres. The basis for this estimate was the analysis of the forage on sample range plots. The field work was done by range examiners of the Grazing Division of the Department of Interior. Their work was supervised by a range specialist from the Rocky Mountain Forest and Range Experiment Station at Fort Collins in cooperation with the Division of Grazing. The field data, which included studies on over 3,000 range plots, were analyzed at the Experiment Station. The results were reviewed by Mr. Milo Deming of the Division of Grazing.

Fifteen acres per cow month were determined as the capacity of winter range lands. This is equivalent to three acres per sheep month. The capacity was determined through analysis of sample range plots in the same manner as described under spring-fall ranges.

The Desert Branch of the Intermountain Forest and Range Experiment Station at Milford, Utah has studied intensively the behavior of desert range plants under use by sheep. Tentative conclusions are that two and one-half acres of Utah desert range per sheep month are required in years of normal or abnormal precipitation. In poor years four to five acres per sheep month are required. One prominent sheepman with several years of experience in handling sheep on Moffat County winter ranges holds to the opinion that two acres per sheep month is a satisfactory requirement. Another one with equal experience recommends four acres per sheep month. These examples are cited for comparison with the figure of three acres per sheep month, which is used in this study in compiling carrying capacity statistics of the winter ranges in the Yampa River drainage.

It should be remembered that the capacity values assigned to the different seasonal ranges are averages. Conditions vary tremendously and the area under consideration is large. Furthermore, the acreages used are gross for all ranges except national forests. In other words, no allowances were made for areas of waste range such as canyons, bad lands, roads, rivers, and other lands producing no forage. It is therefore believed that the gross carrying capacity estimates as stated in cow or sheep months are high rather than low. Probably the most that should be claimed for them, however, is that if numbers are reduced to the approximate indicated capacities, the long continued downward trend in forage depletion will be halted. Whether or not range conditions will improve, and if they improve, the rate of improvement, are questions which will have to be answered by experimenting with various degrees of stocking. Years of excessive use of some of the range lands have brought about changes in soil conditions which will retard forage rehabilitation under any system of management, including no use at all for a period of years. This is especially true in the regions of low annual precipitation.

It may be said that, on the whole, stockmen who are familiar with range conditions in northwestern Colorado agree that a move must be made toward more conservative stocking of ranges. The extent of adjustments is the question debated.

This report makes no pretense of answering that question in exact numbers. It does emphasize the extreme need for concerted action toward relieving the overburdened ranges by any and all means which can be developed by cooperative efforts. Until numbers and capacities are more nearly in balance there will always be a gap between supply of and demand for range which no distribution policy can bridge. In fact, a comparison of present numbers on the range with estimated capacities points definitely to the futility of a policy which attempts to distribute range through reduction of permits of established users to meet demand from overstocked spring-fall and winter ranges.

Present use is summarized in Table No. 3; carrying capacities in Table No. 4; and indicated reductions in Table No. 5. All figures represent cow months. Proportionate ownership of summer range, based on carrying capacity, is shown by Chart No. 7.

Capacities and present use may also be compared on an area basis. Outside of the national forests there are approximately 1,288,000 acres of summer range. The present use is about 450,000 cow months. Thus, 2.86 acres are used for each cow month, which is 31 per cent heavier use than the estimated requirement of 4.2 acres per cow month.

On the one and one-half million acres of spring-fall ranges, the present stocking is at the rate of 7.32 acres per cow month as compared with an estimated requirement of 13.0 acres per cow month. The indicated overstocking is 43 per cent.

Sheep use only on the winter ranges amounts to about 528,000 sheep months. The present use is at the rate of one sheep month to each 1.1 surface acre. This compares with an estimated requirement of 3.0 acres per sheep month, or an estimated overstocking of 63 per cent.

TABLE 3

ACTUAL USE, 1935 - YAMPA RIVER DRAINAGE

(Cow Months)

Land or Forage Classification	County			Total
	Routt	Moffat	Rio Blanco	
<u>SUMMER</u>				
Private Pasture	178708	74212	30000	282920
State Land	25000	9750	0	34750
Routt National Forest	111800	9584	0	121384
White River National Forest	6000	0	56459	62459
Taylor District No. 1	0	49000	5617	54617
Taylor District No. 6	7750	32482	0	40232
Other Public Domain	35000	1400	1250	37650
Total Summer	364258	176428	93326	634012
<u>SPRING-FALL</u>				
Crop Aftermath	30947	12485	892	44324
Private Pastures	35000	32855	0	67855
Total Private Lands	65947	45340	892	112179
State Lands	0	23582	0	23582
Taylor District No. 1	0	29820	6141	35961
Taylor District No. 6	0	80542	0	80542
Total Public Lands	0	133944	6141	140085
Grand Total	65947	179284	7033	252264
<u>WINTER</u>				
Hay and Grain	248090	102207	15352	365649
Private Pastures	0	4283	0	4283
Taylor District No. 1	0	15601	0	15601
Taylor District No. 6	0	97982	0	97982
State Lands	0	2769	0	2769
Total Forage	0	120635	0	120635
Grand Total	248090	222842	15352	486284

SUMMARY
(Cow Months)

County	Season			Total
	Summer	Winter	Spring-Fall	
Routt	364258	248090	65947	678295
Moffat	176428	222842	179284	578554
Rio Blanco	93326	15352	7033	115711
Total	634012	486284	252264	1372560

TABLE 4

CARRYING CAPACITIES - YAMPA RIVER DRAINAGE

(Cow Months)

Land or Forage Classification	County			
	Routt	Moffat	Rio Blanco	Total
<u>SUMMER</u>				
Private Pasture	117361	61343	11388	190092
State Lands	15971	6689	0	22660
Routt National Forest	111404	8380	0	119784
White River National Forest	6000	0	55138	61188
Taylor District No. 1	0	26656	4984	31640
Taylor District No. 6	3999	24064	0	28063
Other Public Domain	29834	735	552	31121
Total Summer	284569	127867	72112	484548
<u>SPRING-FALL</u>				
Crop Aftermath	30947	12485	892	44324
Private Pastures	0	46709	0	46709
Total Private Land	30947	59194	892	91033
State Lands	0	11515	0	11515
Taylor District No. 1	0	14168	0	14168
Taylor District No. 6	0	44811	0	44811
Total Public Lands	0	70494	0	70494
Grand Total	30947	129688	892	161527
<u>WINTER</u>				
All hay	220502	92000	14205	326707
Grains	27910	9000	551	37461
Total Feeds	248412	101000	14756	364168
Taylor District No. 1	0	1512	0	1512
Taylor District No. 6	0	32718	0	32718
State Lands	0	2420	0	2420
Private Pastures	0	2010	0	2010
Total Forage	0	38660	0	38660
Grand Total	248412	139660	14756	402828

SUMMARY
(Cow Months)

County	Season			Total
	Summer	Winter	Spring-Fall	
Routt	284569	248412	30947	563928
Moffat	127867	139660	129688	397215
Rio Blanco	72112	14753	892	87760
Total	484548	402828	161527	1048903

TABLE 5

INDICATED REDUCTIONS IN COW MONTHS

(Difference between Tables 3 and 4)

Land or Forage Classification	County			Total
	Routt	Moffat	Blanco	
<u>SUMMER</u>				
Private Pasture	61347	12869	18612	92828
State Land	9029	3061	0	12090
Routt National Forest	396	1204	0	1600
White River National Forest	0	0	1271	1271
Taylor District No. 1	0	22344	633	22977
Taylor District No. 6	3751	8418	0	12169
Other Public Domain	5166	665	698	6529
Total Summer	79689	48561	21214	149464
<u>SPRING-FALL</u>				
Crop Aftermath				
Private Pasture				21146
Total Private Lands				21146
State Lands	0	12067	0	12067
Taylor District No. 1	0	15652	6141	21793
Taylor District No. 6	0	35731	0	35731
Total Public Lands	0	63450	6141	69591
Grand Total				90737
<u>WINTER</u>				
Hay and Grain	322	1207	596	1481
Taylor District No. 1	0	14089	0	14089
Taylor District No. 6	0	65264	0	65264
State Lands	0	349	0	349
Private Pastures	0	2273	0	2273
Total Forage	0	81975	0	81975
Grand Total	322	83182	596	83456

SUMMARY

Summer	149464
Winter	83456
Spring-Fall	<u>90737</u>
Total	323657

°Indicates a very slight surplus of hay.

It may appear that these details concerning condition, carrying capacity and present stocking of grazing lands outside national forests have no place in a study of Forest Service distribution policies. Obviously the direct responsibility of the Forest Service is management of national forest lands-- not privately owned and other lands. The larger proportion of the land in the area studied is privately owned, public domain or the property of the state. So why be concerned with the condition, or the present or future management of these lands?

There is a twofold object. First, there is the importance of proper land use and its relation to community welfare and stability. This problem is of sufficient importance to warrant consideration by all citizens in the community and by all governmental agencies charged with the responsibility of administering any lands. The second reason is that for years the distribution problem has become more and more difficult principally on account of the ever-increasing demand coming from overstocked ranges and ranches. Through the years, efforts have been made to meet what appeared to be the more meritorious part of this demand. But the demand constantly increased as capacity of outside ranges dropped and as more livestock, more homesteads, and more cultivated areas were brought into the dependent territory by an optimistic people. Stockmen who had built up successful operations on national forest lands have been constantly harassed by annual threats of permit reductions, or by actual reductions, to admit new applicants. Even where distribution reductions were not excessive the ever-present threat has not been a factor conducive of stability. It therefore seems entirely germane to this study to present the best information available concerning condition of all ranges and to reemphasize the futility of attempting to develop a distribution policy which will in any measure satisfy demand from overstocked ranges. The alternative, indicated by numerous facts presented in this report, is to attempt to develop a policy which will stabilize the permits of established users qualified through use of range and ownership of commensurate, dependent ranch property.

The question of dependency is discussed at length elsewhere. Suffice it to say here that winter range lands are highly dependent because no alternative agricultural use without irrigation is possible. These lands are not dependent, however, beyond the proper winter carrying capacity of the natural forage alone. This statement does not deny the need for summer range which is felt by the owners of those ranches which have irrigated lands. Of these lands, 95 per cent are devoted to the production of hay which must be fed to livestock if it is to be most economically utilized. But there are other factors to be considered. First of all there is the character of national forest ranges. By far the larger proportion of these ranges are ideally suited to summer use

by sheep and very poorly adapted to use by cattle. Why? The forage is of the type more palatable to sheep and more economically utilized by this class of stock. Rough topography characterizes the forest ranges. Cattle over-utilize the forage along valleys and in open parks and under-utilize the steep slopes. Where cattle are allotted to such ranges proper range management dictates stocking on the basis of only the accessible feed, leaving the forage on the steep slopes to waste. Thus the ranges produce proportionately less in pounds of meat when stocked with cattle than when stocked with sheep. Calf crops on rough ranges have always been light, averaging around 55 or 60 per cent. The returns from cattle ranches are low at best, as indicated by the data in Section III, and certainly all factors point to the need for methods which will produce the maximum calf crops. Another factor against cattle use on much of the national forest ranges is the presence of larkspur which causes heavy losses. Of all these factors, the most important from the standpoint of management of ranges is the inability of cattle to use rough topography without overgrazing the critical areas along stream courses. There are limited areas within the forests fairly well suited to use by cattle. Use of these ranges will no doubt continue unless changes are brought about by economic factors irrespective of policy. Such changes have been taking place in the Yampa River Valley for the past ten or fifteen years. Were this not so, sheep would not be occupying such a large proportion of the foothill ranges adjacent to the irrigated hay ranches.

Another point to be considered in connection with the irrigated ranches is the possible alternatives in use of these lands. Alternative uses include dairying, poultry production, hog raising, production of cash crops, and conversion of irrigated hay meadows to irrigated summer pasture for cattle and for small farm flocks of sheep.

Dairying now apparently occupies a more prominent place in the agricultural economy of the valley than ever before. The extent to which this industry can be developed is for extension workers to determine. With poultry and production of cash crops, such as potatoes, market and transportation costs seem to be definite limitations. Climate also seems to be a limiting factor in the production of potatoes.

The extent to which it is profitable to convert irrigated hay lands to irrigated summer pastures has not been thoroughly demonstrated in this area. Such data as were available have been presented in Section III. Results elsewhere indicate very satisfactory returns from this phase of farm management. Small farm flocks of sheep on high priced irrigated summer pastures within the irrigation project along the Snake River in southern Idaho show better returns than

when the same flocks are grazed on dry pasture lands, including national forest lands. For years surplus hay in the Big Hole Basin, Beaverhead County, Montana, was utilized by importing cattle for winter feeding. The practice shifted to one in which the shortage of summer range was offset by converting meadows to irrigated pasture. In this territory this conversion has taken place on a rather large scale. Just what can be done in the Yampa River area ought to be determined by experiments conducted by ranchers themselves and by extension workers. Best results may follow introduction of different species of grasses in the pasture mixtures. In addition to the conversion of existing hay meadows to irrigated summer pasture, there may also be a possibility of placing more land under irrigation, but the extent to which this can be done with existing water storage facilities is not known. Land must be almost flat for successful irrigated pasture use. Steep lands used for such purposes will wash badly.

Another possibility for the owner of the irrigated hay ranch, perhaps the most important of all from the standpoint of numbers, is the acquisition through purchase and lease of the foothill range adjacent to the ranches. The first move in this connection will have to be made by adjusting numbers of sheep to the capacity of winter ranges. When this is done, a considerable area of foothill summer range will be released by sheepmen unless they turn to hay ranches for winter feed. Of the total area of 55,338 acres of irrigated land, 75 per cent is at higher elevations within Routt and Rio Blanco Counties; and the remaining 25 per cent is within Moffat County at lower elevations. If the contention of many sheepmen is correct, that sheep cannot be successfully wintered on hay at high elevations, then these high ranches will continue to be identified principally with cattle. This emphasizes the importance of the foothill cattle ranges adjacent to the high altitude cattle ranches. If the reductions on the winter ranges are made as proposed, and summer ranges are vacated, the cattlemen will have to enter upon an aggressive leasing or purchasing program just as the sheepmen have done in the past ten years. These foothill ranges are mostly privately owned as is shown on the accompanying Land Ownership Map.

Indicated reductions have been presented in tables. To summarize these data, consider first the carrying capacity of the summer ranges as the factor which must limit the number of livestock in the area. If 303,576 cow months is taken as indicating the long-time carrying capacity of summer ranges (exclusive of national forests) the indicated reduction amounts to approximately 146,000 cow months. With an average use of the summer range of $5\frac{1}{2}$ months, 146,000 cow months are equivalent to approximately 26,000 cattle, or 106,000 sheep. As has been stated, these foothill ranges are better adapted to use by cattle than other ranges in the area. It therefore

appears logical that sheep should give way to cattle, particularly since it is the winter ranges which are overstocked--not the winter capacity of hay ranches. About 80,000 of the sheep on these foothill ranges in 1935 were owned by lessees who moved to public domain winter ranges outside of the Yampa River unit. At that time, however, land purchasing was rapidly being substituted for leasing and the sheepmen thereby were becoming more firmly established on the range.

The carrying capacity of the winter range is estimated to be 38,660 cow months (nine per cent of the entire winter feed resource) or 193,300 sheep months--approximately 40,000 sheep for five months. Use during the winter of 1934-1935 amounted to about 529,000 sheep months. Most of this use was by 101,000 sheep which remained all or part of the winter on the Moffat County ranges. The 529,000 sheep months also include, however, grazing by trail herds. Trailing use is concentrated south of Yampa River, while the main winter ranges lie north of Yampa River. Any adjustments which reduce use on summer foothill ranges, by the sheep which go to winter ranges outside of the unit, will benefit the summer ranges but will have only a minor effect on winter ranges in Moffat County. Adjustments to relieve these winter ranges will also release additional foothill summer ranges which might be leased or purchased by cattlemen. The number of sheep which properly should use the dependent Moffat County winter ranges can be provided summer feed on the sheep ranges of the Routt and White River Forests. Sheep range on the forests would also be available for the range flocks now operated in connection with hay ranches. In addition, if use of dependent Wyoming desert ranges were adjusted to capacity, the Medicine Bow and Routt Forests could provide the necessary complement of summer range.

The studies indicate that for the entire area the total carrying capacity of winter feed, all hay and that part of the grain which might be fed to livestock, and all winter range, is 402,828 cow months; and that balanced against this capacity are summer and spring-fall range and crop aftermath capable of being fed in the spring and fall for 646,875 cow months. In other words, on the basis of a $5\frac{1}{2}$ -month hay-feeding season, a period which is possibly high for the region as a whole, the supplemental summer and spring-fall range overbalances the need by 170,000 cow months. This excess is utilized by sheep from outside the area. In fact, as was stated, use of this nature is considerably beyond capacities.

In order to tie the discussion of balance between summer and winter resources more closely into the areas containing the bulk of the hay ranches and the national

Moffat County. Adjustments to relieve these winter ranges will also release additional foothill summer range which might be leased or purchased by cattlemen. The number of sheep which properly should use the dependent Moffat County winter ranges can be provided summer feed on the sheep ranges of the Routt and White River Forests. Sheep range on the forests would also be available for the range flocks now operated in connection with hay ranches. In addition, if use of dependent Wyoming desert ranges were adjusted to capacity, the Medicine Bow and Routt Forests could provide the necessary complement of summer range.

...to that fact that the land within the project exclusive of Moffat County will be of interest. No winter range is included in this area. Since the capacities of the national forests have not been divided by counties, such parts of them as extend into Moffat County will be included in this area. The carrying capacity of winter feeds is 263,168 cow months and balanced against that capacity are a summer and spring-fall range and crop aftermath capacity of 387,493 cow months. On the basis of 5 1/2 months' winter feeding season, which is not high for this area, the spring-fall and summer capacity exceeds the winter capacity by 76,481 cow months. As in the foregoing example, this excess, and more, is used by sheep from outside the Yampa River area.

In this discussion we have purposely avoided the division of the ranges between summer and spring-fall use. The reason for this is that the exact division is very difficult to make on account of the wide variation in conditions within the unit. As a general rule, the spring-fall range is inadequate at the higher elevations in Routt and Moffat County. Then too, the seasonal division is extremely variable. Ranges which might be in good condition for spring use at higher elevations in years of light snow might not open up until a month or six weeks later in years of heavy snowfall. Furthermore, spring-fall ranges in the sagebrush type in Moffat County, with forage rehabilitation, might feasibly be converted to summer use for cattle by the development of water. Improvement of these ranges ought to follow adjustment of numbers. Much of these gently sloping hills would provide ideal summer range for cows and calves if the stand of forage can be improved.

On the winter ranges, present stocking can be lightened by shifting some of the sheep for winter feeding from range to hay ranches where winter feeding is practicable. However, average production figures indicate no material surplus of hay as balanced against 1935-1936 livestock numbers to which hay was fed. This checks fairly well with conditions in the Yampa River area as observed during the past ten years. In this period, there were years when considerable hay was left after the winter feeding period, but with longer winters or lowered production, the surplus disappeared. It follows that any material shift of sheep from winter ranges to hay feeding will be through replacement of cattle. It is, nevertheless, probable that the trend will be toward feeding more hay to sheep due (1) to the outstanding need for reductions on the winter range and (2) to the ability of sheep to replace cattle through the more favorable financial position of the former.

Control of excessive trailing will relieve conditions on all ranges, but particularly on the spring, fall and winter areas.

A proposed broad division of the area between classes of stock and seasonal use is shown on the Land Ownership Map. The division is based on relative adaptability of ranges and climatic conditions.

OTHER PROBLEMS

Relating to the Misuse of Lands

One of the economic problems which faces agriculture in this area is that of misuse of lands. All other problems tend to embarrass or to hamper the development of the industry, but that of land abuse threatens its very existence.

The overstocking of ranges is not the only form of land abuse which must be taken into consideration. Running it a close second and passing it in importance in some areas is the cultivation of sub-marginal lands for dry farming purposes. So widely are these dry farms scattered over the area and so nice is the distinction between marginal and sub-marginal operation of lands for dry farm purposes that the exact extent of maladjustment from this source is difficult to ascertain. However, purely sub-marginal dry farm operations are in evidence in all parts of the area and must in the aggregate make up a considerable acreage.

An outstanding example of damage to land values from this source can be found in the vicinity of Great Divide, situated in northwestern Moffat County. This area was widely advertised by land speculators and by a Denver newspaper around 1912-1916, as presenting golden opportunities for farm development. Settlers came in, lands were fenced, buildings constructed, schools and roads were built and thousands of acres of the sagebrush lands were cleared and put under the plow. The investment of time and money was tremendous and resulted in inflated land values. But the whole development, based as it was on the false hope inspired by the bumper crops of a few wet years, fell through with the advent of the inevitable dry years. Of course, the immediate recoil upon the social and economic structure was bad enough. But of long-time consequence is the effect upon the land itself. A loose, easily-eroded soil had been stripped of its cover and laid bare to the ravages of wind and water. Today critical erosion is the rule in this area. Areas which were good range have been ruined for the purpose for years to come. The high run-off from these areas gives a force and momentum to the water carried by the drainages which contribute to accelerated erosion all the way down their courses.

What influence do these two forms of land abuse, overgrazing and cultivation of sub-marginal lands, have upon the agricultural economy? In the first place, they tend to progressively decrease the carrying capacities of the spring-fall and summer ranges, supplemental to the hay lands, and thereby throw the amount of feed and forage available at the different seasons more definitely out of balance. Lower carrying capacities, in turn, mean greater handling charges, lower weights, lower calf and lamb crops, etc., which are all reflected by lower returns to the stock ranchers. Carry the misuse of lands far enough, let erosion get enough control of the area, and the consequent impairment of watershed values will seriously threaten irrigation possibilities both existent and planned.

Unfortunately, the damage being done through land abuse is being done subtly and is often unnoticed by the land users themselves. Only when erosion has reached the critical stage will the average man recognize the damage. It is all the more important, then, that this phase of the economic problem be recognized and that steps be taken toward its solution.

Concerning the disposition of abandoned dry farm lands, the following is quoted from a report submitted to the Forest Service on April 1, 1936 by Mr. Lyle Lindesmith, State Land Specialist of the Resettlement Administration:

Federal purchase recommended

"The Great Divide area of Moffat County has been aptly described in another portion of this discussion. May we state here that even more harsh words might have been used in describing this settlement and use of land as a crime to society.

"To rectify in part this improper land settlement we recommend that the federal government thru the Resettlement Administration make a detailed study in view of purchasing approximately 100,000 acres of privately owned land in this part of Moffat County. This acreage is scattered throughout a total area of approximately 400,000 acres, part of which is at present owned by the federal government and part of which is owned by individuals who are and will be successful ranchers.

"The plan for administration of the area necessarily would be built around controlled grazing, since all studies to date indicate that use as the most satisfactory. Small areas may be used for the production of forage crops, but these areas would be held in reserve by resident owners who can and will utilize the range possibilities there if given the opportunity.

"Who would administer the area is not of great concern at the present time, nor is it for us to recommend. It is likely, however, that part of the area might be placed under the jurisdiction of the national forest where it rightfully belongs because of location. Other portions of the area might well be administered under the Taylor grazing law, also because of location.

"Details of administering the grazing area again is out of the field of the Resettlement Administration. However, with an equitable leasing of 100,000 acres of grazing land, controlled in the efficient manner of our existing public agencies, we of this agency can view the rehabilitation of many present struggling operators.

"Petitions are on file in the office of the state land specialist and the regional office of the Resettlement Administration asking that a large portion of this acreage be bought by the federal government. Such a program likewise has the whole-hearted approval of the county agent, county officials and other vitally interested individuals and groups of the region.

"Other smaller areas might be included in this recommendation for federal purchase. We cannot at this time make any definite statements as to what should and can be done in regard to such sections. We can suggest, however, that a great deal of consideration has been and is being given to the purchase of fairly small areas--for example, one-half of a township--to use as supply tanks of grazing land as needed in periods when the regular ranges are below normal.

"Such an idea, we feel, is worthy of more consideration and might be tried, either by the federal government or by private individuals or groups. Such procedure would tend to cause a steady production--a much desired goal.

Alternative suggested

"If, for any reason, the federal purchase of land in the Great Divide country and other sections of the area is not practical or possible, there is another possibility of bringing much of the mis-used land under proper control.

"Approximately 250,000 acres of land was long-term tax-delinquent last year in Moffat County. Routt County held tax certificates of three or more years standing on about 50,000 acres of land. According to a law passed at the last regular session of the state legislature, county commissioners can take title to this land and dispose of it as they see fit.

"If local grazing districts were formed by utilizing this land, much of which is abandoned, the county would benefit by collecting grazing fees and the ranch operators would be aided by having available additional controlled range."

"It is not logical to think that all of this land could be so conserved. However, we may reasonably expect that several thousands of acres could be brought into a better use by this method."

The problem involved in the future of these dry farm lands has been discussed with Mr. Milo Deming of the Division of Grazing. He expressed his agreement as to the principles of the proposals made by Mr. Limb-Smith.

Mr. Deming, in discussing future land use and consolidations also states that the isolated tracts of public domain in the spring-fall and summer range areas might well be used as base lands for exchange. Through the medium of land exchange federal holdings in the winter range area could be consolidated, thus benefitting the land user as well as facilitating administration. The authors feel there is also a distinct need for the elimination of certain tracts of private lands within the national forests and for adjusting the boundaries to include parts of natural summer ranges. Isolated tracts of public domain in the spring-summer zone could be effectively used as base for exchanges to accomplish this.

Relating to Public Services

Within the area are 3,054 miles of highway, of which 366 miles are state and 2,688 miles are county roads. Of the total mileage, 136 miles or 4 per cent are surfaced, 228 miles or 7 per cent are graded, and the balance of 2,690 miles or 89 per cent is ungraded. The most important road is the Victory Highway, U. S. No. 40. This road connects Denver and Salt Lake City, Utah, and passes through the southern and most densely settled part of the area.

The area is served by 198 miles of railroad all of which are in the Denver and Salt Lake system. This railroad connects the area with Denver and, by means of the Dotsero Cut-off which ties it and the Denver and Rio Grande Western together, provides transportation to the main towns on the Western Slope of Colorado. The entire western half of the unit is at present without railroad facilities. A remote possibility exists that the Denver and Salt Lake Railroad will be extended to Salt Lake City, Utah, and if this is done, it will run through a part of the western half of the area. The Union Pacific Railroad lies in southern Wyoming from forty to seventy miles north of the unit and is used by many of the northern residents.

A telephone system involving 2,835 miles of line offers service to the more populous zones within the unit.

School facilities are represented by 130 schools within thirty school districts and staffed by 228 teachers. High schools are concentrated in the larger towns to which rural pupils are transported by buses. In 1930, the total valuation of schools, land, and equipment was \$765,949 or 195.80 per pupil enrolled. In that same year, of the 4,501 inhabitants of school age, 3,911 were enrolled and the average daily attendance was 3,040.

The entire area boasts but three banks; one at Steamboat Springs, one at Oak Creek and the third at Craig.

Although no figures are available, it is known that all the towns are well supplied with churches.

Electric power is available to the larger towns and centers of population. Outlying districts are without this service or, in exceptional instances, are dependent upon their own power plants.

Relating to Health and Education

As a general rule, health and educational facilities are adequate and of a high standard in the center of population and woefully inadequate or of a low standard in the less densely populated areas. Schools, of course, are a responsibility of the state and are provided by law wherever there is any demand at all, regardless of cost. Doctors and hospitals, however, are dependent upon profits for their existence and cannot function in areas so lightly populated that a supporting income is impossible.

The condition of social services is pretty much in proportion to the farm densities indicated. In western Moffat County, for instance, there are high areas where the farms are so scattered that health facilities are altogether lacking and schools are of low standard. Health facilities are concentrated in the larger towns from Maybell east and ranchers distant from these towns can only take advantage of them by coming to town or paying high transportation costs to the doctor.

Added to the factor of mere distance, in connection with medical services, is that of the condition of the roads. Outlying ranches in the eastern portion of the area may be completely isolated by snow during the winter season. Spring thaws and mud can make minor roads impassable in the spring.

A study made in 1934 by Don C. Sowers and Martin F. Schmidt, of the University of Colorado, and entitled "The Elimination of Small Schools in Colorado," points out some of the problems of rural education. This report shows that the per-pupil cost of education is lowest in the schools of highest enrollment and increases materially as the enrollment decreases. This trend is illustrated graphically for Routt County By Chart No. 9.

Quoting Mr. Sowers: "The solution of the rural district school problem is the most important educational problem facing the state. The small, one-roomed district school is hopelessly inefficient and the thousands of country boys and girls who attend them are deprived of adequate training and equal educational advantages which are enjoyed by the boys and girls who attend the city schools.-- The annual cost of educating a child in this inefficient type of school is three times as large as in the large school system.--The basic reason why a consolidation of existing school districts does not provide an adequate solution of the problem lies in the fact that it does not make much contribution to removing the fundamental inequalities in ability to support schools. If a group of poor districts is consolidated into a single consolidated district, the new enlarged unit will still be handicapped and limited by the fact of its restricted economic resources and its inability to support education."

The significant point is that society is paying an exorbitant price for educating a limited number of children from the isolated ranches and that even then these children are not receiving the educational benefits which are given children in the more heavily populated areas at a cheaper rate.

Various cures have been suggested. That of making the county the educational unit rather than the school district would more evenly distribute the cost of educating isolated children but would not reduce that cost. The solution of running buses is practical in some regions but will not work where great distances and poor roads are involved. The suggested practice of bringing isolated cases to town and boarding them near the school at public expense is attended by still greater costs to society and the undesirable breaking up of the family unit. Probably the only real answer is to get to the root of the problem and eliminate the isolated sub-marginal farm operation. The better type of ranch which happens to be removed from educational facilities will continue to solve the problem as it is already solving it--by moving all or a part of the family to town for the school season.

Relating to Comforts Associated with Moderate Standards of Living

The maintenance of a moderate standard of living is dependent upon two factors: First, an income of sufficient size to make possible the ordinary necessities and comforts of life; and second, a physical location which does not deprive the individual of the social advantages of contact with his fellow-men nor the public services which contribute materially to his general welfare.

Chart No. 8 illustrates graphically, the classifications of farms according to the value of the products produced. The value of the income is assumed to be proportionate and approximate division between three standards of living--subsistence, moderate, and excellent--has been indicated. It is significant that 42.5 per cent of all farms in the area were on a subsistence standard in 1929, a year of general prosperity and of high crop production. The comparison of all farms with the stock ranches and animal specialty ranches indicates the greater proportion of income in the higher brackets within the latter. It is evident from these charts that a very real problem exists if the general income level is to be raised to that needed to maintain a moderate standard of living and that the problem is more acute on the farms mainly dependent upon products other than livestock than it is on the livestock ranches.

Relief statistics (see pages 19 and 20) indicate that a large number of farmers are not producing sufficient income.

Another factor which is a necessity to a moderate standard of living, that of accessibility to other people and to public services, is available to farmers in proportion to their proximity to the more settled areas. In connection with the discussion of schools it was pointed out that some ranches are far removed from the communities, may be altogether isolated for a part of the year, and are generally undesirable from a viewpoint of education. Such ranches are also deprived of the benefits of churches, amusements, and social contact which the communities afford. Individual tastes differ and some individuals find a hermit-like existence satisfactory. For the average person, however, no amount of income can compensate for the social disadvantage inherent in an isolated existence.

It is well to remember that human happiness is dependent upon the balance between desires and the satisfaction of these desires. In a county of comparatively recent settlement, such as this one is, a large proportion of the people are still of the pioneer type and are accustomed to and satisfied with a very simple manner of living. Modern conveniences, considered an absolute necessity to the average

city dweller, would be classed as luxuries by this class of people. Succeeding generations, however, tend to be less satisfied with the basic necessities and to demand more and more of the modern conveniences and luxuries. Although this trend is intangible and is not susceptible to absolute proof, it is generally recognized by sociologists and is a factor which should be taken into consideration in long-time community planning.

Desirable Adjustments in Costs and Availability of Public Services

All three counties, but especially Moffat County, have a settlement pattern which indicates a dispersed population, rather than a population which is concentrated in a few major valleys. The great number of schools, roads and telephone lines bears this out.

Each school, each mile of road, or telephone line, serves a smaller number of persons than in a concentrated settlement. Costs per capita must be higher. Also to provide these services, the residents in the concentrated settlements must bear part of the additional costs to provide such services in the sparsely settled areas. Nor are these the only drawbacks to a scattered population. The services, as a whole, are inferior, and many residents are beyond the reach of them. What has been said of schools, roads and phone lines can also be applied to religious and health facilities, law enforcement, amusement and other social factors as well as all the factors pertaining to government.

Under such conditions, life is more severe, cultural facilities are scarce, and the general pattern of life must develop more slowly than it does for the rest of the nation. Taxes and other charges for various services are relatively high. The conveniences which can be purchased with incomes are often not available.

With reference to this subject, especially in terms of taxes, G. S. Klemmedson ^{1/}, in a "Preliminary Report on Farm Tax Delinquency in Colorado," has this to say:

".....Then there has been no sound or comprehensive plan for the utilization of land. Homesteaders have been permitted to settle on one section of land where 10 or 20 were needed to make a respectable living.

"This unguided expansion stimulated the building of schools, the construction of roads, and other rural development. It created fictitious speculative values for all types
1/ G. S. Klemmedson, Associate Economist, Colorado Agricultural College.

of land, values that are still reflected in some of the tax assessments.

"Thus, many sections of Colorado have too much government in proportion to the wealth and income of the local community. Even if the assessment is reduced, governmental expenditures cannot be curtailed to as great extent as the reduction in the value of property and the income of the taxpayer....."

"Without question something in the nature of county or state zoning must be applied to the lands. The county or state, acting thru boards, in the interest of all, should decide what shall be done with the different areas of land. No one proposes to apply zoning so drastically as to undo much of the work already done or to depreciate the investment made. The plan should be to do the zoning in connection with land which is not now put to proper use. It means that the land which is now producing little or nothing can be put to a logical use, probably mostly in grazing land or forest while waiting for agricultural demands to increase to the point where this land will be needed for food production. Within some counties are thousands of acres of grazing land which has been plowed up for dry farming, often in large blocks, which are not developing agriculturally at all at present, and are not likely in the near future to show progress. Within these areas are now and then schools with costs running into hundreds of dollars, and with county roads entailing great expense, yet accommodating very few people. There is a limit to the amount of government which a given community can afford. Consolidation of small units of government for administrative purposes would assist in relieving the tax load on communities where a considerable portion of the land is delinquent.

"The community which ignores this limit may find itself demanding functions of its government which the local people cannot afford and which can be met only by property taxes under our present system of taxation in Colorado which is ruinous, destroying property values and impoverishing the rural areas of the state. The natural result is that land goes into delinquency and eventually gets into possession of the government itself."

It is not to be inferred from this discussion that this community is in dire circumstances. While 75 per cent of the land in Moffat County is tax delinquent, Routt County has retired all outstanding warrants, has a cash balance on hand, and is in general in a good position financially, according to recent information. The foregoing adjustments are being pointed out merely as ways to improve the social situation and at the same time effect economies which ought to result in decreased costs of government and public service.

EFFECT OF PROVIDING FOR OTHER PUBLIC NEEDS

Public Needs for Wildlife Development 1/

The potential possibilities of wildlife production in the Yampa River drainage are undeniably great, but there are today areas of considerable extent within the drainage suitable to the production of big game animals and other wildlife species in which there are few or none; streams which once were well stocked with waterfowl, furbearers and fish are either barren or greatly understocked. To determine the reasons for this condition, and to establish a basis for discussing the possibilities of the area for wildlife production, it is necessary to delve into the past history of Routt and Moffat Counties.

In the early Eighties, prior to any considerable amount of settlement, elk were conservatively estimated at 20,000 head in Routt and Moffat Counties; deer were even more numerous, and the sage plains literally teemed with antelope. Besides deer, elk and antelope, large herds of buffalo formerly ranged in the great sage country of western Routt County, which was considered some of the best bison range in Colorado, and more than a few mountain sheep inhabited the rougher sections, particularly the bluffs and rims adjacent to the many canyons. Upland game birds prospered in great numbers, and the Yampa, Snake and Green Rivers provided feeding and resting grounds for migratory waterfowl during the flight periods, and to a lesser extent, nesting grounds for them. These same streams and their tributaries were well stocked with important furbearers, beavers, muskrats and minks. Otters, though never very abundant, also inhabited these same waters. In addition, such furbearers as fox, red and gray; marten; skunk; badger and weasel were found in abundance in the adjacent plains and forests. Naturally, as in any country bountifully stocked with game, predators, including wolves, coyotes, cougars, bobcats and bears, black and grizzly, were common.

The so-called "desert range" of western Routt and Moffat Counties, prior to the invasion of man, supplied the winter range for the game herds which in summer grazed in the foothills and mountains of that country in and near what is now the Routt and White River Forests. The desert range, however, supplied some summer range to antelope, mountain sheep and to limited numbers of deer, elk and other wildlife species, which chose to remain there yearlong. Regular migratory routes were established by these herds for travel from summer to winter range, some of which were more than ninety miles in length.

1/ Prepared by A. A. McCutchen, Wildlife Specialist, Region Two, Forest Service.

The first settlers of Routt and Moffat Counties were attracted there by the wildlife resources, and they were dependent upon game for their very existence. Wild game supplied them with meat, hides and fur. In addition, sales of these products provided cash for supplemental necessities. As settlements increased, and people became more numerous, the exploitation of the wildlife resources became more intense. Four horse wagon loads of deer, elk and other game were killed for market; many were killed merely for "sport," and left where they fell; enormous catches of furbearers were taken; all without any regard to the rapidity of depletion. By 1890, elk had been reduced to 10,000 head; to 1,000 in 1900; and by 1910, only 150 head remained. In thirty years' time this great herd had been reduced to a mere fraction of its former numbers, and other wildlife species were correspondingly reduced by unregulated killing; in fact, two species, the buffalo and otter, were completely exterminated.

The wholesale reduction in wildlife populations which accompanied settlement is little short of astounding. The most tragic part of it all is that wasteful and unregulated killing was entirely responsible for decimation.

There is no logical reason for believing that the wildlife resources could or should be restored to their original abundance. In the first place, there is no need for such numbers, and secondly it would not only be economically unsound, but impossible to eliminate livestock and agriculture from the area for the sole purpose of producing wildlife. There is, however, a need for greater numbers of wildlife in the area, as is evidenced by the fact that there has been no open season on mountain sheep and antelope for a great many years. Further evidence is that there has been no open season on beaver; and other furbearers are so few in this great expanse of country as to make trapping hardly worth while.

In supplying the public need, the first objective in wildlife production should be to produce numbers on a sustained yield basis, up to the capacity of the natural resources, consistent with other existing forms of proper land use. Just what the actual numbers for the different species should be at the present time is unknown, and cannot be determined, but it is considerably above present populations. Wildlife numbers to be produced cannot be determined until the Routt and Moffat Counties' ranges are properly stocked with domestic livestock; then wildlife species should be permitted to increase up to the range capacity. On all properly stocked ranges there is still room for certain numbers of wildlife, because of waste range which is inaccessible to or unused by stock, and because of the difference in feeding habits between these classes of animals. Even accessible

areas which will support no livestock because of other adverse characteristics, provide a habitat for certain forms of wildlife. In addition, there are many wildlife species, such as predators, furbearers and waterfowl, which are only indirectly dependent upon the forage resources for food.

When the time comes that all ranges are properly stocked to capacity with livestock and wildlife on the bases outlined above, any greater public need for more wildlife based on real demand, will necessarily have to be determined by the agency or agencies administering the ranges, and adjustments made between game and livestock accordingly.

Environmental conditions were materially changed by settlement in the Yampa River area. Large tracts of the original game range, particularly in the low country, were homesteaded and made to produce livestock and agricultural crops. These withdrawals of virgin range not only reduced the extent of the game range, but blockaded the old migratory routes, which forced big game animals to adopt one or the other of their seasonal ranges for yearlong existence. The blocking of the migratory trails has very definitely limited the number of deer which can be produced on the Routt Forest, where an abundance of summer range is available. Winter snows are too deep on the forest for deer to winter, and there is no place for them to go since their routes to the old winter range have been eliminated by man. All accessible land not actually in private ownership now supports thousands of domestic livestock, instead of thousands of deer, elk and other big game animals. Nearly all ranges, private and public, outside of the national forests are in various stages of depletion as a result of over-use by domestic livestock. But in spite of all these changes, environmental conditions are splendidly adaptable to the production of wildlife. Even under present range conditions, there is sufficient forage for larger numbers. There is no denying the fact that there is competition for forage between game and livestock on some parts of the area, but there are few if any game losses directly from starvation. This competition, the lion's share of which is furnished by livestock, reflects on the range, not on wildlife numbers. The true conflict, where existent, in the area is between game and settlement, as is evidenced by the Routt elk herd raiding ranches in the Elk River Valley and its tributaries, and settlements blockading the old migratory routes. Forage has not been and is not now the limiting factor in wildlife numbers; the controlling factor has been and is today, unregulated killing, legal and illegal.

It is said that those residents in the western part of the study area who want game take it any time they so desire, in season or out, in spite of game laws to the contrary.

Hunting is said to be as unrestricted as it was in the pioneer days; even in the unpatrolled Douglas Mountain State Game Refuge. The steady drain upon wildlife species inhabiting the Region, from illegal killing, the legal kill in the open season, which in Colorado is state-wide outside of the refuges, and the losses from predators and natural causes prevents a satisfactory increase in number. Unless adequate protection from these is had, it will be impossible to build up the wildlife resources, regardless of any and all other provisions which are made for them.

From the standpoint of forage requirements, the most urgent need of wildlife is a program of livestock management which will provide for proper and conservative use of the range resources, and insure a maximum sustained production of forage. Unless deterioration of these ranges is checked, their carrying capacities for both livestock and wildlife will steadily decrease. The maintenance of the livestock industry and wildlife on a sustained basis must be predicated upon proper and conservative use of the forage resources.

In summarizing, the wildlife resources may be adequately provided for by application of the following broad Regional policies:

1. Proper use and stocking of all ranges with domestic livestock which will permit depleted ranges to recover, and after recovery, to maintain maximum production.

2. Determination of wildlife numbers to be produced on the area, based on public demand, the capacity of the natural resources, and existing forms of land use.

3. Restoration of wildlife resources to the desired number by:

- (a) Controlling the kill, legal and illegal. A rigid, effective program of law enforcement, and control of legal hunting in understocked areas must be had to permit the wildlife resources to restore themselves to the desired number.

- (b) Making provision for the needed numbers of wildlife species through reasonable adjustments of existing forms of land use, such as agriculture and livestock use.

- (c) Controlling other sources of loss, such as predators and disease.

4. Control of wildlife numbers after objective has been reached. When this point has been reached, the annual crop must be harvested to prevent overstocking the range.

Public Needs for Recreational Development 1/

As stated elsewhere in this report, recreational values are definitely recognized as a natural resource, and as such therefore they are subject to the same basic principles of management as forage, timber, and other natural resources. In short the recreational resources of the national forests should serve the economic and social interests of the public to the highest possible extent, from a national viewpoint and on a scale fully commensurate with their ability to satisfy the demand.

A comprehensive study of the various forms of recreational use permits their segregation into two general types: extensive and intensive. The extensive type of use includes hunting, fishing, general sight-seeing and similar activities wherein full enjoyment of the recreational values in question is not affected adversely by the current existence of other forms of use, including the grazing of sheep and cattle. In fact, other forms of use often lend themselves in making local environment more interesting and attractive. It will be obvious therefore that the continuation and enlargement of this form of recreational use will have no effect upon the available supply of range for domestic stock.

On the other hand, however, the intensive type of recreational uses assumes an entirely different aspect. It includes highly specialized forms of use incident to public campgrounds, picnic areas, resort sites, hotel sites, and summer home sites, whereon human occupation is paramount. In fact, human use of these areas, during the recreational season, often is highly concentrated and at times approaches the saturation point. Obviously, therefore, with actual use of these land areas comparable to a degree with that found in established community life, the necessity exists for the adequate protection of these recreational areas on an equally comparable basis. Common use of campgrounds, picnic areas, resort and summer home sites, and similar areas, within the intensive type, by humans and domestic stock is no more possible than similar use would be in community life, if health is to be preserved and full enjoyment of the area made possible. Accordingly, with minor exceptions, plans for the development and maintenance of the intensive type of recreational use will provide for the exclusion of domestic stock from the areas classified and dedicated to such type of use.

The extent to which this policy will affect the available supply of range for domestic stock cannot be stated in concrete terms. However, our past experience indicates that any reductions needed to take care of expanding recreational uses will come

1/ Prepared by R. E. Clark, Division of Lands, Region Two, Forest Service.

about gradually, will be imperceptible to the range area and will be absorbed without disturbance to the stock industry.

Timber Production 1/

Stands of tree reproduction are adversely affected by livestock grazing during their early life; if given adequate protection during this period, however, tree growth will otherwise hold its own.

Very young trees of coniferous species, from two inches to six inches in height, are often indistinguishable in appearance from grasses and weeds, and are often injured, therefore, both by the trampling and the cropping of livestock. Cropping does not result from special palatability, so far as is known, but from failure to distinguish the small trees from other surrounding plants. For this reason, it is advisable to exclude grazing from young forest plantations, involving as they do a considerable financial investment, for a period of approximately ten years. In Region Two, approximately 5,000 acres are planted each year.

Again, during the period in which the height of young trees varies from three feet to eight feet, forest growth is susceptible to damage from rubbing by cattle; and the elimination, or at least the restriction, of grazing by cattle from such stands is advisable. This damage is particularly severe during the fly season and is caused by all classes of cattle, although bulls are undoubtedly the worst offenders. Trees at this stage of development are browsed somewhat by sheep, but ordinarily only along driveways or on other overgrazed areas of limited extent.

The net result of damage to forest growth by livestock is most conspicuous, so far as Region Two is concerned, in the ponderosa pine type, which reaches its best development in the southwestern part of Colorado, but is also common in other parts of the State. (Grazing is completely excluded from young plantations on the Nebraska National Forest.) This species, i.e., ponderosa pine, is especially susceptible to damage because, whereas other species may reproduce naturally with sufficient density to exclude all forage, ponderosa pine often appears in open stands intermixed with forage that attracts grazing. Also, it often grows on relatively level areas such as cattle appear to prefer. Although there is a lack of factual basis, there is nevertheless considerable indication that many young seedlings are killed by livestock before they grow above the surrounding grass and weeds. However, there is ample evidence on many areas that trees three feet to eight feet high are kept indefinitely at such heights and badly deformed by the destruction of growing tips and by other mechanical injury from grazing cattle.

1/ Prepared by H. D. Cochran, Assistant Regional Forester,
Region Two, Forest Service.

In addition to the control of grazing on young plantations, special attention is needed to the regulation of grazing on areas supporting young ponderosa pine trees until they attain an average height of 8 feet. Otherwise the amount of damage to tree growth must be balanced against the value of the forage resource and such contribution as it may make to economic stability in near-by communities.

Watershed Protection

The importance of water and watersheds to the local community has been mentioned. (Page 14) The water resource of the Yampa River is of material value and influence in addition to the local importance. The watershed discharges annually some 1,500,000 acre feet as run-off water to the Colorado River. This forms an important contribution to the potential supply of water for power development in the canyons of the lower Colorado River and for irrigation and municipal water supplies in the lower Colorado River basin states of Arizona, Nevada and California.

Stream flow records ^{1/} which indicate the high water yield value of this watershed show for Yampa River at Steamboat Springs a mean annual runoff of 778 acre feet of water per square mile of drainage area. Elk River is shown as having a mean annual runoff of 1099 acre feet of water per square mile of drainage area. For comparison, the Yampa River drainage area above Maybell, Colorado, though less than half as large as the Green River drainage area above Green River, Wyoming, actually discharges 90 per cent as much water.

The importance of water and watersheds is universally recognized. Growing is the appreciation by the public of the relationship which exists between plant cover and runoff, soil and erosion conditions. That these resources must be conservatively used is less frequently debated. Discussions are turning more toward methods of conservation.

Range distribution policies must therefore take into account the public needs for watershed protection. Generally speaking plant cover on mountainous and hilly ranges can be so used by livestock as to maintain satisfactory watershed conditions. This has been demonstrated in the National forests. It should continue to be the policy of the Forest Service to determine and obtain the proper degree of livestock use on the ranges where watershed values will not deteriorate through use.

There will be isolated areas, usually a negligible part of a forest, where on account of very steep slopes, soil, and cover characteristics, use of the plant cover by livestock should be materially restricted or excluded to protect watershed values.

^{1/} Water Supply Paper No. 618, U. S. Geological Survey

V. BASIS OF DISTRIBUTION POLICIES

This study of distribution problems has been based on the thought that recommendations for future policies could be more intelligently formulated by analyzing the agricultural and range situation in a specific and representative area. This analysis has been made and has been summarized in the preceding pages. The next step is to consider the broad public objectives which are to guide in the development of specific distribution policies.

Basic objectives cannot be determined by analysis alone of facts pertaining to a limited region or set of conditions. Inferences can be drawn from the analysis, but the broader purposes of government in administering national resources must strongly influence conclusions. With this viewpoint, certain objectives have been evolved:

(1) The Progress Report of the National Resources Committee, published June 15, 1936, makes this statement concerning that important resource--the soil:

"Nations in other parts of the world have prospered for hundreds or thousands of years because either by luck or good management they were able to preserve their soils. In the Orient some of the flat lands have been preserved by careful fertilization. In Peru the land was terraced at a staggering public cost, creating a stable civilization which endured until it was conquered by the Spanish invasion. The cost of survival depends on the density of population and on the extent to which it is forced to use poor or sloping land. If the population is small enough to afford land for grazing rather than for plow crops, the problem of preserving the land is far simpler and the necessary discipline is less severe. In America, with our present population and our present knowledge of agricultural technology, we can easily support ourselves by plowing only the flat lands or the lands that can be terraced without great expense. We have enough land to afford to raise cattle without overgrazing, and we can afford to turn our mountain sides into forests without over-crowding ourselves in the valleys. America, therefore, does not need to submit to the drastic ant-like discipline by which Egypt and Peru held back the desert. But America cannot escape the necessity of controlling the present ominous wastage of land."

In the long run the success of all agriculture and related efforts depends upon the maintenance of soil fertility. This is an undebatable fact. In contrast, the extent or degree to which various agricultural practices affect soil fertility may be a moot question. Nevertheless, we feel it is generally accepted as a fact that there are certain

practices which result in varying degrees of soil depletion and that these practices are not in the permanent interests of the public or of the individual. Stockmen long ago recognized that plowing under the grass in arid and semi-arid regions could not result in a permanent and self-supporting agriculture. That the protests which they voiced were justified has been proved by the dust storms and wholesale abandonment of dry-land farms in recent years. These stockmen, as a group, also recognize the existence of certain limitations in the use by livestock of natural forage crops, the wide difference in opinion as to when a range is properly used notwithstanding. The significant thing is the recognition that somewhere in the degree of use is a limitation which, when ignored, results in displacement of the more palatable forage plants and in gradual decline of soil and range values. Conservative use has long been an objective of the Forest Service. This objective we resubmit with confidence it will be generally accepted as a primary obligation of government, in the light of the condition of forest resources after thirty years of management.

It is a primary obligation of government to secure such use of the natural resources of the Nation, as to yield the maximum, permanent, public benefits.

(2) Within the national forests are numerous resources which are the property of the Nation. Some of these resources, such as commercial stands of timber, range forage plants and minerals, have a measurable value. To recreational resources, watershed influences and wildlife, a monetary value cannot be so easily assigned. The value of a resource, the need for it and the degree to which it is used also vary tremendously with location. Furthermore, values, needs and uses constantly shift with a changing national economy and viewpoint. Such shifts make it necessary to effect adjustments in the degree or forms of use of different resources, if there are to contribute the maximum public benefits. Adjustments at intervals for the protection of resources may also be imperative. A certain flexibility in administration is vital in order to effect these adjustments.

Some forms of use of national forest resources are transient in character and may require little investment of private capital. In contrast, the use of the forage resource by stockmen is usually inseparably connected with the use of other lands and necessitates investments of varying amounts of private capital. Of course, any stockman invests capital whether he enjoys a forest grazing privilege or not. But whatever his yearlong operation may be, he has, if he is successful, built up a system of management in which his seasonal feed resources are in approximate balance. In other words, livestock numbers and his winter feed resources are in approximate balance with his spring, fall and summer feed resources, irrespective of where or in what form any one of the resources may be. When any one of the seasonal resources becomes out of balance with another, he is forced to make adjustments, which are rarely in his interest or in the interest of proper and conservative land use.

Numerous data are presented in this report indicating the need for greater stability. Each individual ranch and range operation is a component part of its community. Community stability in agriculture is attained as the various ranches and range operations in the community are stable. The greatest factor in the stability of a livestock business seems to be a conservatively used and continuously adequate plant to carry on a satisfactory operation for an indefinite period of time.

A national forest grazing privilege is a part of the permittee's system of management and an appreciable proportion of the permittees have used the range through a long period of years. The permittee has adjusted his operation on lands outside of the forests to approximate balance with his forest grazing privileges. His financial and credit structure is based upon his balanced year-round operation. Adjustments in the degree to which he uses national forest range force expensive adjustments elsewhere and lead to uncertainty, instability and sometimes to financial ruin.

The limited forage resource within the national forests (usually only a relatively small proportion of all available summer range) renders it impossible, from the standpoint of a satisfactory livestock business, to allocate a share of the resource to all ranches and livestock operations. This fact must be recognized in determining objectives. The national forests, therefore, can contribute to the stability of the livestock industry only to the extent it is practical to distribute the grazing privilege. When that point is reached, further distribution is usually the result of yielding to optimistic demands and leads to instability.

It is not the intent of the foregoing statement to imply that the present distribution of grazing privileges is fully satisfactory in every case. Numerous needed adjustments are mentioned in this report. The intent is to indicate the need for policies which will gradually bring about needed adjustments and thereafter a minimum of distribution of grazing preferences.

A fundamental objective is to encourage stability in the use of natural resources consistent with the relative importance of different resources and the public interest.

(3) Livestock ranching can be efficiently carried on in small units. Unlike other enterprises, such as mining, it is not necessary to produce on a very large scale to overcome large risk and development costs. In fact, the evidence at hand indicates that, with a few outstanding exceptions, extremely large outfits are not so efficient as smaller ones. Furthermore, the size where maximum efficiency begins to decline is about where one owner, or at most, two or three partners, can effectively oversee and manage all phases of the operation personally.

The organization of ranches varies considerably in each community, with subsistence ranches, single family enterprises, partnerships and corporations being represented, depending on the type of plant, resources and managerial ability. The returns, investments and costs of operations likewise vary. Evidently, each type of organization is considered most satisfactory in its own sphere and under its particular conditions. There is no evidence that one particular form is more successful than the others, except that the greatest number are single family enterprises, operated to support that family. Larger concerns, however, employ more labor, very frequently of the type which is unable or unwilling to assume the responsibility and hazards incidental to an individual operation.

In formulating policy, these factors must be kept in mind. While there are numerous families on ranches whose incomes may be regarded as unsatisfactory, it is extremely doubtful if existing satisfactory units should be penalized to aid such families. Likewise, it is equally doubtful if the larger operations should be severely restricted in the use of the range, with the attendant decrease of employment of laborers and managers, in order to provide more range for individual family operations. Some reasonable balance of allotting range between various types of operations seems necessary, according to dependence of their operation and need for range. The particular type of operation might best be left to individual judgment and not inferred by regulation or policy.

In distributing grazing privileges on the public ranges, it might be argued that these should be granted to the small so-called subsistence operations in order to increase the resources to which they have access and thus increase their incomes. It might also be argued that they should be granted to the most efficient livestock producer or to the larger operations, who hire more labor, including many of the subsistence ranchers. Or it might be argued that they should be granted only to the going, single-family enterprises.

If public range is to be considered as a subsidy or relief measure, to aid subsistence and sub-marginal outfits to raise their incomes, then a program of wide distribution to small operations is desirable. Evidence at hand indicates that all of the small operations cannot be aided. They frequently lack the capital and ability to build up and maintain a satisfactory unit and range would need to be withdrawn from existing satisfactory units, reducing the economic status of many of these.

If public ranges were to be sold at full market value, then there is no particular need to limit or restrict monopolistic tendencies. The smaller and less efficient operations would be unable to compete. Such a course would commercialize the range and would seem to have a tendency to limit permittees to a relatively few large outfits. Such a condition is not in harmony with American ideals. Neither alternative is considered desirable. It may be assured then that range should be allotted so as to encourage neither condition, but to contribute the most to any reasonable and satisfactory operation which needs and can use the range. The question of need is not so much one of whether this individual or that corporation needs public range. Rather, it is a question of these winter

feed resources or that winter range requiring summer range to make the use of all these resources effective and of maximum benefit to the community.

It appears reasonable, therefore, that the objective should be to base distribution primarily on the need for range, which is to say, on the ownership or control of dependent lands. Where demand based on dependent lands exceeds the available range, it seems likewise reasonable to give preference in such a way as neither to promote monopoly nor to use it as a relief measure to aid uneconomic operations, but rather to pursue a middle course in order to assist the greatest number of satisfactory outfits which the combined resources of the community can support.

The allotment of grazing privileges should be based on the economic need for range to promote sound livestock operations without monopoly.

VI DETERMINATION OF SPECIFIC DISTRIBUTION POLICIES

Before summarizing and stating specific distribution policies it is necessary to investigate certain other subjects which have not thus far been considered in this study. These additional subjects will be discussed in this section of the report.

TURNOVER IN GRAZING PERMITS

Amount and Cause of Turnover

An analysis of the grazing permit turnover history of one grazing district on each forest in Region 2 (excepting Nebraska) was made in an effort to determine the effect, if any, of past distribution policies on tenure of permit. A grazing district was selected for the study where the history of permits was known to the District Ranger or to some other member of the forest personnel. Information on specific cases was sought from the older grazing permittees, retired forest officers and others. Grazing permit files were also reviewed. Included in the study were all closed cases on the selected district wherein grazing permits were issued from 1915 to 1934 inclusive. The study includes 2,308 cattle cases and 626 sheep cases.

The average duration of these permits in years by size classes is pictured on Chart No. 10. The average life of a cattle grazing permit in the 1-40 cattle size class was found to be 3.9 years. This compared with an average life of 5.7 years for permits of 41 to 100 cattle; 7.0 years for permits of 101 to 200 cattle and 8.5 years for permits of more than 200 cattle. This analysis indicates increasing stability as the size of the herd increases.

A more striking comparison, with further indication of instability in the small groups, may be made by considering the total number of permits in each size class. Here will be found further indication of the comparatively short life of the permit for small numbers.

Terminated Cattle Permits by Size Classes

<u>Size Class</u>	<u>Number Permits Terminated</u>	<u>Per Cent of Total</u>
1-40	1,412	61
41-100	523	23
101-200	209	9
201-350	72	3
Over 350	92	4
Total	2,308	100

A heavier permit turnover in the smaller size groups is to be expected since there are now and always have been more stockmen using national forest ranges with small permits than with large permits. This is illustrated by the number of cattle permits by size classes issued on all national forests in Colorado in 1934.

<u>Size Class</u>	<u>Number of Permits</u>	<u>Per Cent of Total</u>
1-40	1,384	47
41-100	844	28
101-200	434	14
Over 200	<u>341</u>	<u>11</u>
Total	3,003	100

The ratio of the number of permits in the 1-40 cattle size class, issued in 1934 on all national forests in Colorado, to all permits issued for numbers in excess of 40 cattle is 1 to 1.13. The turnover ratio between the 1-40 class and all larger classes in contrast is 1.54 to 1, as determined from the tabulation of terminated permits. This comparison is a further indication of the relatively greater instability of the smaller units.

An analysis of the sheep permits develops similar results. The average life of a sheep grazing permit in the 1-250 class was 2.5 years; 3.3 years for permits of 251 to 500 sheep; 3.4 years for the 501 to 1000 group; 4.8 years for the 1001 to 2500 group; 9.1 years for the 2501 to 4000 group and 7.2 years for permits above 4001 sheep. Stability in tenure of permit increased as the size of the operation increased up to the three or four band outfit and then declined. A possible reason for this decline is that the three or four band outfit represents the point of most efficient operation from the standpoint of management. As the size increases above this number, it may be that under average managerial ability, the chances for a long-time profitable operation decrease.

The number of sheep grazing permits included in the turnover study, by size classes, are shown in the following tabulation.

Terminated Sheep Permits by Size Classes

<u>Size Class</u>	<u>Number Permits Terminated</u>	<u>Per Cent of Total</u>
1-250	198	31
251-500	107	17
501-1000	119	19
1001-2500	150	25
2501-4000	33	5
Over 4000	<u>19</u>	<u>3</u>
Total	626	100

For the purpose of making the same comparison for sheep as was made for cattle, a tabulation is included showing the number of sheep permits, by size classes, issued on all national forests in Colorado in 1934.

<u>Size Class</u>	<u>Number of Permits</u>	<u>Per Cent of Total</u>
1-1000	540	61
1001-2500	284	32
2501-4000	36	4
Over 4000	<u>31</u>	<u>3</u>
Total	891	100

The ratio of the number of permits in the 1 to 1000 size class issued in 1934 on all national forests in Colorado to all permits issued for numbers in excess of 1000 sheep is 1.54 to 1. The turnover ratio between the same size groups is 2.03 to 1. This again demonstrates the relatively greater instability of the smaller outfits.

Aside from the indication of stability or lack of stability, the turnover study points to another and perhaps more important fact. It is often stated that Forest Service policies have resulted in consolidating the grazing privilege in the hands of a small group of permittees, and thus, new applicants are seldom given an opportunity to share in the grazing privilege. The information available indicates the opposite is true, as will be pointed out in the following:

Comparison of Number of Permits and Number of
Permitted Livestock - 1915 and 1934
All National Forests in Colorado

<u>Size Class</u>	<u>1915</u>		<u>1934</u>	
	<u>Number Permittees</u>	<u>Number Stock</u>	<u>Number Permittees</u>	<u>Number Stock</u>
1-1000	172	89,985	540	246,436
1001-2500	196	290,775	284	439,736
2501-4000	25	80,986	36	112,568
Over 4000	<u>23</u>	<u>169,517</u>	<u>31</u>	<u>171,307</u>
Total	416	631,263	891	970,047
<u>Cattle</u>				
1-40	1,706	30,453	1,384	31,042
41-100	716	48,814	844	56,308
101-200	341	48,758	434	64,497
Over 200	<u>346</u>	<u>168,020</u>	<u>341</u>	<u>132,304</u>
Total	3,109	296,045	3,003	284,151

The number of sheep permittees increased 114 per cent during the period with a 35 per cent increase in the number of sheep. The number of cattle permits decreased approximately one per cent with a decrease of about four per cent in the number of permitted cattle. During this period, there were numerous eliminations of the lower foothill regions from national forest. These lower areas had been used exclusively by cattle. Consequently, the eliminations reduced the area of available national forest cattle range. Sheep increased through opening to use of high ranges formerly considered inaccessible to any class of stock and by conversion of ranges once considered suitable for use by cattle to use by sheep. As is pointed out by the State College of Agriculture and the Bureau of Agricultural Economics in their report, the latter change was influenced by the more favorable economic position of sheep.

During the twenty-year period there was a net increase of approximately nine per cent in the aggregate number of both classes of permittees. With this in mind consider the permittee turnover during the same years. The total of 2,934 permits of both livestock classes, which terminated on the grazing districts studied. The number of districts included in the turnover study is about one-sixth of the total area of the national forests in Region 2. We may, therefore, say conservatively that approximately 14,000 stockmen were in and out as grazing permittees in Region 2 during the twenty years. The results of this analysis are at least indicative of the extent to which new applicants were given an opportunity to graze livestock on national forests. Unfortunately, we may also read from this record an appalling degree of instability, even admitting that some part of the turnover was incident to normal business transaction.

As a result of the turnover study, a great many causes were assigned as the reason for the termination of permits. The actual cause, however, was often difficult or impossible to obtain. For example, the record might show that a permittee sold his livestock or ranch and waived his preference. The real reason for the sale might have been inadequate financing, heavy livestock losses, possible profit or merely a desire to liquidate temporarily. The best information obtainable was used and the reasons grouped under the following twenty-one headings:

- A. Business on a speculative basis. Inadequately financed.
- B. Liquidation forced by creditors.
- C. Livestock unit too small.
- D. Forest permit too small on account crowded range.
- E. Home ranch sub-marginal.
- F. Inexperience or poor management.
- G. Sold to take profit; retirement; death--permit not renewed.
- H. Sold with waiver.
- I. Death. Permit renewed by heirs.
- J. Livestock Operation incidental to main business.
- K. Change from cattle permit to sheep permit.

- L. Change from sheep permit to cattle permit.
- M. Loss of outside free range upon which operator depended.
Often homesteading the cause.
- N. Heavy winter losses.
- O. Shift to private range, public domain or Indian lands.
- P. Home ranch too far from forest range.
- Q. Summer range losses too heavy.
- R. Purely temporary permits. Lack of qualifications for preference.
- S. Failure to comply with Forest Service or stock association rules.
- T. Range lands eliminated from forest.
- U. Unable to determine probable reasons.

The results of tabulating the turnover record by size classes and reasons are shown in Tables 5 and 6. The following conclusions are drawn from all of the information considered:

(1) Instability, particularly from the standpoint of the tenure of a grazing permit, seems to be an inherent characteristic of the small livestock business in the Rocky Mountain Region. The rancher with small herds seldom obtains all of his income from range livestock. He makes the best of opportunities for outside employment. He has the time to give attention to dairy stock, poultry, hogs and the production of cash crops. In other words, he has alternatives in the use of his land. Consequently, he may take advantage of favorable markets and local opportunities for trading and selling. If he chooses, he can liquidate his entire number of range livestock and turn his attention temporarily to some alternative. Sale for personal reasons was therefore a common reason for termination of permits. The larger number of such terminations occurred in the smaller groups -- below 200 head of cattle and one band of sheep.

(2) Terminations due to inadequate financing or speculation, seem to increase, particularly with cattle, as the size of the operation increases. This trend is shown when only percentages by size classes are considered. (e.g., 11 per cent of the 1-40 cattle class; 20 per cent of the 101-200 cattle class; and 25 per cent of the class of 350 or more cattle were terminated for this reason.) When numbers only are considered, the preponderance is in the smaller size groups.

(3) On a percentage basis, failures due to inexperience and poor management increase with size of operation. This is to be expected since the necessity for a greater degree of managerial ability is greater with the larger outfits.

(4) The tendency to shift the operation from cattle to sheep is more definite than the tendency to make the opposite shift. This is due to the more favorable position of sheep from the standpoint

TABLE 5

NUMBER OF SHEEP PERMITS TERMINATED ON SELECTED
GRAZING DISTRICTS, R-2, 1915-1934

Reasons for Termination of Permits	Permit Size Class - Number of Livestock													
	1-250		251-500		501-1000		1000-2500		2500-4000		Over 4000		Total	
	Number and Per Cent of Permits Terminated													
	No	%	No	%	No	%	No	%	No.	%	No	%	No	%
A. Speculation	31	15½	15	14	17	14	21	14	2	6	2	11	88	14
B. Foreclosure	4	2	9	8	7	6	9	6	5	15			34	5
C. Size	35	18	6	6	4	3	1	½					46	7
D. Size	2	1	2	2	1	1							5	1
E. Ranch														
F. Inexperience	20	10½	13	12	12	10	7	5	3	9	1	6	56	9
G. Profit	20	10½	11	10	22	19	36	24	4	12	5	26	98	16
H. Waiver	1	½	3	4	12	10	26	17	8	25	8	42	58	9
I. Death	2	1	2	2	6	5	7	5	7	21			24	5
J. Side Line	23	12	11	10	2	2	2	1	1	3			39	6
K. Change					1	1							1	
L. Change	8	4	6	5	6	5	8	5½	2	6	1	5	31	5
M. Range														
N. Losses														
O. Other Range	4	1½	3	3	2	2	5	3					14	2
P. Distance							1	½			1	5	2	
Q. Losses	18	9	7	6	2	2	1	½					28	5
R. Temporary	12	6	6	6	8	6	14	9½					40	6
S. Rules														
T. Elimination			1	1	3	2							4	1
U. Unknown	18	8½	12	11	14	12	12	8	1	3	1	5	58	9
TOTAL	198	100	107	100	119	100	150	100	33	100	19	100	626	100

TABLE 6

NUMBER OF SHEEP PERMITS TERMINATED ON SELECTED
GRAZING DISTRICTS, R-2, 1915-1934

Reasons for Termination of Permits	Permit Size Class - Number of Livestock											
	1-40		41-100		101-2000		201-350		Over 350		Total	
	Number and Per Cent of Permits Terminated											
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
A. Speculation	155	11	93	17	42	20	11	15	23	25	324	14
B. Foreclosure	26	2	21	4	16	8	2	3	3	3	68	3
C. Size	64	4	19	3							83	4
D. Size	14	1	2	1	1	1					17	1
E. Ranch	21	1	4	1							25	1
F. Inexperience	99	7	50	6	20	10	10	14	11	12	170	7
G. Profit	326	23	155	29	66	32	18	25	15	16	580	25
H. Waiver	47	3	37	7	15	7	8	11	16	18	123	5
I. Death	45	3	23	4	9	4	8	11	2	2	87	4
J. Side Line	86	6	8	1	1	1			1	1	96	4
K. Change	34	3	27	5	4	2		7	10	11	80	3
L. Change	5	1	2	1	1	1					8	1
M. Range	4	1	2	1	1	1			3	4	10	1
N. Losses												
O. Other Range	49	3	13	2	8	3	4	5	2	2	76	3
P. Distance	2										2	
Q. Losses	11	1	3	1	6	3					20	1
R. Temporary	225	16	51	11	10	4	4	6	2	2	292	13
S. Rules	12	1	6	1					1	1	19	1
T. Elimination	26	1	2	1	1	1			1	1	30	1
U. Unknown	161	12	25	5	8	4	2	3	2	2	198	9
TOTAL	1412	100	523	100	209	100	72	100	92	100	2308	100

of returns and also to the fact that high mountain ranges within the national forests are better adapted to use by sheep. These factors are commented on in detail elsewhere in this report.

(5) Terminations resulting from the home ranch being sub-marginal all occurred in cattle permits for less than 100 head; mostly in the 1-40 group.

(6) It is interesting to note that only two permits were terminated because the home ranch was too far from the forest range. Use of dependency zones in approving permits has probably been a factor in holding the number small. Applicants too far from forest ranges to use them advantageously have been rather generally excluded under dependency zone policies. Another inference may be that distance from range is unimportant with modern transportation facilities.

(7) Another reason for the brief tenure of forest grazing permits cannot be read from charts and figures. This reason might be termed the disillusionment of the permittee. Public range has always been considered free range and when the National forests were established, the low fee charged for the grazing privilege did not change public attitude. Forest range was still considered free range or at least range to be distributed at a very low price. The range use privilege was something the government had to give away and everyone wanted a share. Distribution policies fostered that attitude and many stockmen had their try at the use of rough mountain ranges. Disillusionment, especially to cattlemen, came with predatory animal losses; with low calf crops; with poison losses; with losses due to straying of animals accustomed to farm flock methods of management; with open range handling costs; and with inconveniences due to the necessity for community or cooperative methods of handling. A high rate of permittee personnel turnover was the natural result, particularly among small owners who found costs and losses, not anticipated, to offset low fees for forest range.

Years of experience indicate that, as a general average, rough mountain ranges can be used efficiently and conservatively only by the more experienced range man.

Relation of Policy to Turnover

In what manner and to what extent have Forest Service grazing policies affected the turnover of permittee personnel? If it is desirable to minimize turnover how can policy be shaped to effect the desired objective?

A large proportion of the reasons determined as causing termination of permits bears no relationship to the use of national forest ranges. Inexperience, poor business management, speculation, inadequate finances, winter losses and death of permittee are examples of elements and conditions which are not influenced by distribution policies.

In a second group of causes may be placed those which represent a physical condition of national forest range. In this group there is a relationship to policy. When a stockman terminates his permit because of heavy death losses on the summer range the distribution policy may be faulty. The elimination of all poisonous plants from summer ranges is an impossibility. Furthermore, years of experience have demonstrated that a more practical and economical method is to minimize losses by allocating to the range the class of livestock least susceptible to the predominating injurious plants. Similarly, rough topography is a condition characteristic of national forest ranges. Years of unsuccessful efforts have demonstrated the impossibility of producing satisfactory calf crops, ^{on rough mountain ranges, by any practical methods.} Low crops, while not heretofore emphasized as a cause of failure, have probably contributed to cattle permit turnover as much as any other one thing. Certainly the low calf crop is one of the major reasons why cattle generally, as now managed, are less profitable than sheep. These physical conditions may be said to be unchangeable, but the extent to which they adversely affect stability in the tenure of permit should be alleviated by policies which will result ultimately in harmonizing livestock use with them.

Another class of causes for permit turnover is more directly the result of a distribution policy. A policy aimed at wide distribution, one which ignores entirely the inherent characteristics of the open range livestock business operated on a small scale, or one which fails to recognize the relative dependency of different types of operations, are examples. Full consideration should be given these elements in evolving future objectives and policies.

Forest Service grazing policies have been in harmony with governmental philosophy concerning the disposition of public lands, which, among other things, encouraged "homesteading." The grazing policy undertook to aid the home-builder by making a wide distribution of the grazing privilege. This was justified in the days of settlement and development of new lands. Early use of the western ranges was by strong outfits with large numbers of livestock. With the coming of the settler a movement toward smaller and an ever increasing number of units was inevitable.

Government land policies have changed as witnessed by the enactment of the Taylor Grazing Act. Homesteading is of the past. But before the land policy was changed the distribution of land went too far. Too many people were settled on poor land which can never be made to support a family satisfactorily. Delinquent tax lists, abandoned dry farm lands, resettlement programs, and other activities are evidence of this. In livestock producing communities the trend in land ownership has shifted toward the consolidation of holdings. This is very definitely indicated in the Yampa River valley by the land purchasing and leasing programs of the more successful livestock operators. There is every reason to believe this trend will continue. The small sub-marginal farm units will be gradually absorbed by the more successful range men. This will undoubtedly be the trend in regions where livestock production

predominates. It may not apply in all irrigated, diversified farming areas where cash crops can be successfully produced.

In summation, the study of grazing permit turnover indicates most strongly the need for a shift in the grazing distribution in very small units policy from one fostering wide distribution/to one whose object is to stabilize the established, dependent, and commensurate user of national forest range.

DEPENDENCY

There is a certain segregation of seasonal resources in nearly all livestock operations. Winter feed is produced on certain areas, spring and fall range is found on other areas and summer range on still others. Each of them is dependent upon the others to produce a balanced operation--one which will provide continuously, the year round, for a predetermined number of stock. If hay supplies are adequate for 100 cattle, then to carry that number the ranch operation must have sufficient spring and summer range for 100. If hay supplies are too great, then part of the hay must be sold, creating non-dependence on the part of that hay. Or a larger number of cattle must be fed, leading to overstocking of the spring and summer ranges. Dependency enters into the picture of distribution of grazing permits since most national forest ranges are seasonal in character--usually summer range. To contribute most to community welfare and stability and to promote sound livestock operations, such seasonal resources must be integrated with the resources used at other seasons. The resources on winter and spring ranges and hay meadows cannot be so effectively used nor contribute so much to the community in themselves alone, as they can if they have sufficient summer range to carry the stock during that period when those resources cannot be used. This seems to be the real basis for a distribution policy. It is the need of certain seasonal resources for other seasonal resources existing on national forest lands, and the use of all these resources in such combination as will contribute the most to the community and to each of the various units which compose the community.

Dependency, of course, does not exist on areas on which all the yearlong resources are contained within a single range or ranch unit. Such a range or unit might be termed self-contained.

Dependent lands are complementary. Hay meadows are complementary to summer range. One piece of summer range is ordinarily not dependent upon another piece of summer range, unless it is used at a different period. Such lands are supplementary and non-dependent.

The amount of dependency or the number of livestock involved in interdependent land use is measured in terms of commensurability and will be discussed under that heading. This, as discussed in connection with commensurability, includes such factors as overstocking of some complementary lands and an apparent dependency for a larger number than the real dependency or actual carrying capacity.

This discussion concerns itself chiefly with the degree of dependency existing between different lands.

All winter or spring feed or forage resources are dependent upon summer resources (summer range in most operations). These are dependent upon some summer range but not necessarily national forest range, since only a portion of the total summer range is usually within the forests (37 percent in the Yampa area). Off hand, it appears that each dependent ranch operation might be entitled to its pro rata share on the basis of amount of winter and spring-fall resources controlled. Such a procedure is not practical, especially as it affects smaller outfits. It then becomes necessary to select those operations requiring summer range which shall share in the use of forest ranges, and to reject those which either are not considered as entitled to summer range or which might better use other summer ranges.

The aim then is to create a dependency situation to the extent possible, which will foster conservation of resources, stability and the promotion of sound livestock operations without monopoly, as outlined under the basic objectives. It may be assumed that desirable dependency will be fostered by selecting the most desirable operations, as judged by the objectives, to share in the use of forest ranges.

Existing Use. The ranches of new applicants are only potentially dependent upon public range. Present permits represent actual, existing dependency. In other words, existing use or "prior use" as it is sometimes called, is a factor to be recognized in determining relative dependency. It appears that no desirable existing permit should be terminated or reduced, and established dependency disturbed in order to provide for a new applicant. By desirable is meant a permit which is in full accord with the basic objectives. Nothing is to be gained by such a procedure. The question immediately arises, "does the permit of ten years' standing provide greater dependency than one issued five years ago, and does the five-year-old permit make its commensurate lands more dependent than the lands on which last year's permit is based?" To the extent that continued use tends to solidify such use and that while the permittee is using the forest range, other available ranges gradually pass into other control, this is true. However, as soon as a permit is issued, certain adjustments must be made by the permittee to take advantage of the new range and to include it in his scheme of operations. The non-

permittee who applies, has not made such adjustments. Accordingly, there is a definite difference between the permittee with existing dependency and the applicant with potential dependency only. Existing use should, therefore, be recognized. The length of time it has existed is not so important.

Dependent Areas. Distance affects dependency, since it is commonly conceded that a nearby ranch is more dependent upon range than one at a considerable distance. If stock are driven long distances, it involves some expense and destruction of range, as well as competition with the nearby applicant. However, nearby operations may be decidedly sub-marginal, and it may in such cases be best to recognize the dependence of more desirable lands lying at a distance. It may be said then, that proximity alone cannot be considered as creating greater dependency, but where equally satisfactory and desirable operations are dependent, the nearer may be considered as relatively more dependent. When available resources are inadequate to fully meet the needs of satisfactory nearby communities, certainly there is no reason to spread their use to more distant areas. The danger to be avoided is in so restricting the limits of areas considered as dependent as to grant permits to many nearby, relatively non-dependent operations.

Dependency Zones have been established on most Region 2 forests to limit grazing applications and competition for permits. Probably some of them or even most of them have included too little territory. These zones, as now established, operate to limit new permits and increases to operations relatively near the forests. The general principle is good. As long as entirely satisfactory, nearby operations cannot be completely accommodated, it does not seem reasonable to extend privileges to distant operations.

However, too close application of zoning around the forests would have the tendency to limit new permits, transfers and increases to those living near the forests, very often in the foothill settlements. It may have a tendency to increase land values near the forests, as it appears to have done in this study area. There is also a tendency toward increased land use and settlement in the back areas. Cases have arisen where sheepmen have purchased ranches within the dependency zone in order to qualify for permits. Actually such ranches have later turned out to be unfit for wintering sheep, and the sheepmen have sought an opportunity to remove their operation to lands outside the dependency zone.

There is an opportunity, very seldom if ever used, of zoning around the more desirable and most dependent ranching areas, without direct relationship to forest boundaries. An example would be a zone line completely around a small dependent valley, excluding isolated ranches, outside the valley, which have access to surrounding summer range. Even such zoning might be arbitrary and discriminating, unless it follows the same lines as established under state or county zoning laws.

One difficulty with dependency zoning is that it provides a fixed hard and fast boundary, whereas dependency is relative, as has been shown. The ranch just outside the zone may be fully as dependent as the one just inside.

There is, in each case, a certain area which may be vague or well defined, and which is influenced by transportation facilities, topography, available resources, and many other factors varying with each area, which might be termed the dependent area or zone of influence. To avoid wide dispersal of permits it seems advisable to define this general area or to zone it and to restrict new permits and renewals and waivers to this area. Such an area or zone should not be established to restrict permits to about the number which can be accommodated, but should include all communities in which there are potentially dependent ranches -- operations which could use forest range efficiently if it were available. It will limit permits to dependent areas, but not necessarily the dependent area to the carrying capacity of the forests.

There are other factors which affect the degree or quality of dependence, as will be shown later. However, all of these depend upon a more or less arbitrary preference for one type of operation over another. The fact that actual dependency exists once a permit is granted seems to indicate that the continuance of such use should not be restricted by these other conditions.

It is frequently stated that the Wyoming permittees are not dependent on Colorado summer range and that the range privileges should be granted to ranchers in the nearby Colorado Valleys. An analysis of this situation indicates that if the Wyoming permits were extinguished, one of two things is likely to happen: Either these stockmen will purchase or lease Colorado summer ranges in competition with Colorado, or some of these outfits will be forced out of business. In the first event, nothing will be gained, since it will merely mean a shift in control. In the second event, it would have a decided effect upon Wyoming communities.

On other forests, a dependency situation has developed, involving stock coming to the range from ranches located a considerable distance from the forest. Even though nearby dependency has developed since these permits were first granted, it does not follow that permits should be taken away from the distant outfits, and redistributed to nearby ones. After all, the criterion of stability is continued existence.

It is recommended, therefore, that existing permits be continued, within commensurability and size limits. Existing use will be construed as establishing actual dependency. Waivers should be recognized only in the broad dependency zones in order to prevent too widespread scattering of permits and in recognition of the principle that satisfactory nearby operations can use the range to better advantage than those at a distance.

New Permits. The same principles should apply to new permits, except that most frequently a choice must be made, since ordinarily the applications exceed the supply of range. To select those most entitled to grazing privileges, the following factors, developed from preceding basic information, may be of use:

1. Alternative land uses on private operations. A common situation is one in which some ranches, either through necessity or choice, depend upon livestock production as their main source of livelihood. Others are diversified with crop production or dairying either as the chief enterprise or as a side-line.

Cash crops, dairying, etc., of course do not require range livestock in themselves and do not necessarily contribute to a balanced operation. The lands used for such purposes are not dependent upon range (except dairying to a minor degree). It follows then that as more of the land is devoted to uses other than livestock production, the unit becomes less dependent.

It is a question of proper use of lands. The governing factor in dependency in this connection seems to be "Is livestock needed to make a satisfactory operation?" It will probably require a study of the economy of each community to determine in what operations livestock is required.

As indicated in Section III of this report, in the Yampa area, crop production, except as a source of feeds, is not generally recommended. Consequently, it cannot be said that any unit should cease livestock raising and should produce crops. It is likely, however, that some dry farms and a number of irrigated ranches will continue to raise grains, potatoes or carry on a dairy enterprise. But it cannot be said that other units should do this, since such agriculture is not suited to most of the area.

In other areas where crop production is desirable the observation might be made that if such lands do not need livestock, they are non-dependent. Usually there are a few stock ranches which require range to continue to operate and these are dependent. However, diversification, such as a combination stock-crop enterprise, tends to spread risk and ordinarily contributes to stability if the operations are sound. Cases will arise where ten farms, each with a permit for fifty cattle, may be of greater benefit to the community than one straight livestock outfit with 500 cattle. By-products, such as pea-straw, beet tops, etc., may create dependency where these must be fed, provided the market situation is such that the purchase of feeders is not practical, as now appears to be the case in the Yampa area.

The vital question is that of relative need for livestock in connection with these ranches. This may be extremely difficult if not impossible to answer. Some cases have come to notice where fruit farming has proved unprofitable and the ranchers have suc-

ceeded better by shifting to alfalfa and grains. This may lead to a greater wintering capacity of livestock and an increased dependence on summer range, and to increased competition with established stock ranches.

One observation might be made here. Although there are many other considerations besides the cost of range, if forest fees are lower than the cost of private ranges, there may be an incentive for crop farmers to run a few range livestock with the idea of increasing their income through the use of the forest range, even though these stock might not be necessary to the economy of the operation. If fees are at a proper value and if no undue subsidy or advantage exists in the use of the forest, then the running of livestock on such farms would indicate a real need and not so much an attempt to get something for nothing.

It is admitted that is only one phase of the problem. And there are many examples, notably on the Eastern Slope, where small herds of stock seem to fit definitely into the small diversified operation irrespective of available forest range.

Another alternative is that of making a ranch self-contained, either partly or entirely, through conversion of part of the hay meadows to summer pasture as pointed out in Section III. In the eastern portion of the Yampa area, this has been shown to be practical within certain limits.

Complete conversion would be possible in the case of large ranches running 400-500 head or more, but not so profitable due to a necessary reduction in the size of herd, and would be largely impossible on small ranches running less than about 150 head, unless some other range is available. For medium-sized ranches, it is possible to make these partly self-contained. Wherever the practical possibility exists of making a unit self-contained, dependency ceases to exist. The matter of the limits to which this is practical will be discussed in connection with size of units.

2. Desirable Sizes. Dependency exists regardless of size. The homestead with one cow is dependent upon some summer range. Very small ranches or ranches with small numbers of stock may be dependent on forest range but such dependency, from the standpoint of the entire community, may be regarded as not particularly desirable. Such small ranches should be able to avail themselves of small tracts of nearby range. Of all cattle owners in this area, 50 percent own less than 200 sheep. The recognition of desirable dependency on the part of these ranches would dissipate national forest resources so that it would not materially improve the lot of any of these ranches and would harm more substantial outfits. Similarly, very large outfits can monopolize large blocks of range and make it impossible for the rank and file of the community to develop their units satisfactorily.

3. Desirable location. It is generally recognized and this report has emphasized that a scattering, isolated population increases the expense of providing government and public service. Consequently, the recognition of dependency on the part of small and scattered ranches withdraws resources that may be needed to provide for units which are more concentrated. It may be argued that the isolated ranch must have the opportunity to make a living for its owner, since governmental policy encouraged the settlement of such areas. This is not disputed, but with the tendency toward elimination of such units through proposed zoning laws and resettlement activities, the widespread granting of privileges to this class may later interfere with desirable land use plans. Furthermore, if dependency is recognized, just because of the proximity of a ranch to the forest, it may encourage operation of scattered ranches in back areas to qualify for a permit.

A permit which has been granted to an isolated settler cannot very well now be withdrawn and abandonment of the unit forced. Such permits should be continued until the proper agencies can accomplish resettlement in the more desirable areas, or until such operations are on a recognized satisfactory basis.

4. Availability of complementary lands. In some areas, summer range, as public domain, state lands and private lands, is available. Nearby ranches can make effective use of these lands, frequently as well or better than national forest ranges. Such outfits, would be relatively less dependent upon national forest range than ranches in the more settled valleys, which usually do not have access to other range lands. Very frequently it is true that ranches near the forest boundaries are not so dependent upon the forest range because of this one factor--the availability of other range.

5. Proper use of lands. A range which is used in the winter is not fully dependent upon summer range if that range can also be used in summer range, provided there is a shortage of summer range. An overproduction of hay does not make a ranch dependent to the full extent of the hay if spring range is inadequate to properly carry that number of stock. The cultivation of areas not suited to the raising of crops, in order to provide for wintering stock, should not necessarily be considered as increasing dependency.

6. Value of lands. From a community standpoint, it may be considered that valuable land is relatively more dependent than less valuable lands. For instance, a developed hay ranch would be more dependent than a piece of undeveloped range land because of the values involved. It

would mean less loss to a community to allow a piece of low-grade range land to lie idle because of lack of complementary summer range, than to let a well-developed hay ranch lie idle for the same reason. Similarly, a ranch in a good farming community would, other things being equal, outrank one in an isolated or sub-marginal community.

The development of farming lands in areas which are sub-marginal for one reason or another is not to be desired nor encouraged. However, where satisfactory areas have been developed and values increased, the denial of range privileges to the operators of such farms, in order to provide for more extensive range operations, does not appear desirable.

The conclusions to be drawn from this analysis are that permits, which are based on fully commensurate ranch property and which are within the size limits as discussed in another part of this report, should not be disturbed. Existing use should be recognized as having created actual dependency. Where new permits are to be issued as a result of vacant range, these various applicants might be selected on the following bases:

1. Within the limits of the following factors, new permits should be granted to operators of ranches near the forest in preference to those at a distance.
2. Permits should be granted to operators of ranches which need livestock and which have no other alternatives of making a livelihood from the land without range stock, in preference to those who have no such alternatives. Ranches which can economically be made self-contained are not so much in need of a permit as those which cannot be made self-contained.
3. Permits should be granted on the basis of more valuable commensurate property in preference to less valuable property, other things being equal.
4. Permits should be granted for use in connection with the proper use of commensurate lands in preference to operations making improper use of such lands.
5. They should be granted to owners of operations which are of a size adequate to succeed and carry on the enterprise over a period of time in preference to operations which are too small or so large as to constitute a degree of monopoly. On the basis of Section III, the minimum might be set at 130 cattle or 400 sheep for this area.
6. They should be granted to owners of operations

who do not have the opportunity of acquiring or owning suitable complementary lands in preference to those which have such an opportunity.

COMMENSURABILITY

Commensurate property means property of the kind and amount necessary to furnish feed or forage for the class of stock, in accordance with the actual requirements in the locality during the portion of the year when it is not grazed upon the national forest. The present Manual definition seems acceptable here, except that the words "actual requirements" have been substituted for "custom." Too frequently the custom in a locality has been to generally abuse or overgraze commensurate lands. Those who have made an effort to use their lands conservatively have felt that the range or ranch exploiter has an advantage over them. Such complaints are common in this study area and many of them are justified.

Commensurability attempts to measure the number of stock involved in a balanced operation during the time they are off the forest.

In Section III of this report, it is stated that commensurate property must be definitely useful to the operation, also that such property must be complementary and must be used as intended and not in some other way. The above definition recognizes very definitely these three factors. Property which is necessary to an operation is certainly useful and since it is measured in terms of the time stock are off the forest it should be complementary to the forest range. The fact that it should be used as intended means that it must be available in the amount actually required and must be used as complementary, not supplementary.

From the ranchers' point of view a national forest permit is a lease to balance or round out the year-round producing capacity of his ranch. Ordinarily, especially in winter feeding operations, the practice is to own the hay meadows and to own or lease a variable amount of spring or spring-fall range used in connection with the meadows. Summer range may be obtained on the forest if possible, or it may consist of more or less suitable leases or ownership to round out the operation through this period. The point is that summer range is needed; that it is needed in the amount necessary to balance the operation as determined by the number of stock which the resources can provide for at other seasons. It is the purpose of commensurability to measure the capacity of the ranch in order to determine the amount of summer range (ordinarily) needed to round out the operations on dependent lands.

Crops Not Used for Livestock

Forest range can be used only by livestock. It can contribute nothing directly to a grain or fruit or dairy farm, except through livestock. Consequently commensurability may as well be confined to those lands and those crops which directly determine the number of stock required. To include cash crops and other products would add little and would confuse the issue. At any rate, lands and crops not used directly in connection with livestock production are non-dependent. Grain cannot supplant hay, except to a minor extent, in the Yampa drainage. Grain is fed due to certain economic conditions or because of special animal husbandry practices. It need not be used in computing commensurability, although where it offsets the hay requirement it could be used to that extent. Potatoes, lettuce, strawberries and similar crops, have no connection with livestock production, and consequently none with commensurability.

The practice of converting grain to a money value and then determining the amount of hay of an equal value adds nothing to commensurability standards. The exchange of one crop for another adds nothing to an operation, except for possible profits which were not considered in the commensurability valuation. If hay is not purchased with the proceeds from the sale of grain, then the rating for the ranch is too high. This method should be discontinued where it is now used. Each crop or range used in connection with livestock should be reduced to an animal months' basis.

Critical Periods

In order to simplify commensurability ratings, frequently all resources have been lumped or certain easily ascertained values, as hay production, have been chiefly used. In most operations there is at least one critical period when the ranch is not so well equipped to handle the livestock as at other periods. In most operations, the critical point is lack of spring range. An over-production of hay will not offset such lack, except to the very limited extent that the feeding season can be lengthened.

It seems, at first glance, that commensurability ratings might be confined to such critical periods only, in order to simplify procedure. In some communities, this would work out, but there is always the danger of a few permittees' gaining an advantage over others if they are favorably situated. For instance, by measuring spring range only, as an example of a critical period, a few ranchers may be in a position to control larger blocks of spring range than are

needed, cutting down the feeding season and higher winter feed costs, to the detriment of the community, which may as a whole be decidedly lacking in spring range. This would be controlled to some extent by the maximum limit.

It seems best, therefore, to consider all periods, with minimum feed and forage standards to apply during each period applicable to the community, or possibly the individual operation. The need for summer range would be determined by the need for and amount available of winter feeds or range and spring and fall range. Under the present application of commensurability, a rancher might raise hay for 300 cattle for five months and have spring range for 100 for two months, with a five-month season on the forest. Converting hay and range to animal months, we get 1,700 animal months or a commensurability of 243 for seven months. Unless he can make a definite adjustment with regard to the spring range, and actually does so, he is properly commensurate for 100 cattle.

Rented Property, Permits and Licenses

In Routt and Moffat Counties, 984 farms are operated by full owners and 318 by part owners. Part owners are operators who own some of the land in the ranch operation and lease some. By confining this to stock ranches we find 148 full owners and 105 part owners. Nearly all of the larger or more substantial operations lease a part of their operating unit, while many of the smaller outfits are unable to do so. Consequently, it can be said that leasing a part of the unit is a very common and generally accepted feature in the livestock industry, not only in this area, but throughout the West.

Similar to leasing is the matter of control -- usually of public lands. In the Wyoming desert, the common practice is to own alternate sections of railroad lands, controlling an equal amount of public domain. Doubtless, under the provisions of the Taylor Act, either leasing or grazing permits will replace control so that this feature need not be considered.

Licenses or permits on the grazing districts, in this area at least, will be largely for winter grazing. These public domain winter ranges naturally are dependent on summer range and the question arises whether or not this summer range should include national forest summer range.

It has been argued that the permittee on a Taylor grazing district should not have a second permit on the national forests. The philosophy in connection with such an argument is that those dependent outfits which have neither licenses nor permits on public range should be given an

opportunity to share in one or the other type of range before anyone is allowed to share in both. Such reasoning is based on the assumption that an advantage exists in the use of public ranges, usually a cost lower than for comparable privately owned range lands.

Such a restriction of permits, ^{to} either the public domain only or to the national forest range only, involves a number of factors. The permittee or licensee on public domain winter range would not have range comparable with good national forest summer range. Then, too, the checkerboard land ownership situation, such as the intermingled railroad and public domain lands in Wyoming, further complicates the problem.

An analysis of this problem indicates that such advantages as the user of public range may have over the user of privately owned lands should be remedied at the source -- by elimination of such advantages insofar as possible. A restriction in use, to the extent that any one permittee may use either public domain or forest range but not both, does not seem equitable nor justified, so long as such a condition does not lead to a situation where land ownership is not required, and the permittee can move from one public range to another in competition with the rancher who must have an investment in land for part of the year's operations.

Licenses or permits to graze on public range should be regarded in the same manner as leases so far as commensurability is concerned. That is, the amount of grazing secured on a district should be considered as part of the resources allowed aside from owned resources.

Practically every sound, stable outfit owns some sort of headquarters or home ranch. The tenant, too, fills a definite place in the economy of the community but he does not have the investment in lands nor is he obliged to remain in business to liquidate such an investment. Not owning the lands, he is more apt to exploit them.^{1/} Consequently some ownership of land must be recognized, just as it is advisable to recognize some leasing or use of other ranges, but the latter should not be substituted in full for the former. It seems reasonable to require the ownership of a substantial amount of land. Just how large this ownership in relation to additional leased lands should be is difficult to say.

It should not be low enough to discriminate against ranchers who own considerable parts of their holdings nor should it encourage "shoestring" outfits from gaining permits with a very small ownership of land. It should also not be so large as to impose severe restrictions upon permittees or to force a greater investment than non-permittees find necessary to run an outfit successfully.

^{1/} National Resources Board report.

The most common practice among cattle ranches and most winter-feeding sheep ranches is to own sufficient land to produce the required amount of hay for the feeding period. In the case of Wyoming desert operators about half of the usual winter range is owned in the form of alternate railroad sections, with some additional control of vacant land outside the indemnity limits. With the advent of the Grazing Districts, use of the Colorado winter ranges will probably consist in a four to six months license or permit, and from three to five months on owned or leased spring-fall range.

After considering all angles, it seems reasonable that a national forest permittee or applicant, to be fully qualified should own sufficient property to provide for at least 50 per cent of his commensurability, either in terms of the total feed or in per cent of time off the forest. The other 50 per cent must be fully controlled through lease, permit or license, or otherwise.

Provision must be made to check commensurability periodically since some commensurate property may be lost through loss of lease and this unless replaced should mean a like reduction in permit. Possibly leases as long as the term permit or longer should be accepted if term permits are issued, as shorter term leases are relatively insecure. Perhaps a more secure form of permit should be given for owned lands than for additional short term leases.

Conditions should not be arbitrary. It has been argued that commensurability requirements have been arbitrary and often not in accord with good economics. The foregoing provisions, have been formulated in an attempt to avoid this as far as possible.

Probably the most satisfactory arrangement would be to have the permittee or applicant file a work sheet or some form of agreement--much more complete than the present form provided on the back of the grazing application--on which all feeds, feed-producing acreage, and grazing lands, both leased and owned, are listed. The permittee should show the extent to which the stock will actually use each item. It provides in effect a plan of managing the ranch from a feed and forage standpoint which will allow the supervisor or advisory board of the stock association to determine the number of stock which can be carried during the various periods.

Any commensurate property should be definitely useful. Requirements should not be such as to cause uneconomic investments or to require property which is not needed. Rather, the emphasis should be on the proper use of the available lands and resources.

Proper use of lands. The overstocking or excessive use of commensurate lands creates an apparent dependency greater than the real dependency or true carrying capacity of all resources involved in the operation. If winter and spring-fall ranges were credited as being commensurate for the number of animals actually run instead of the proper carrying capacity, the policy would in effect condone overstocking. In the first place such overstocking is decidedly harmful to the commensurate property and affects the stability of the operations involved. To allow a preference to accrue on the basis of overstocked private ranges would result in a declining production and either greater demand for additional privileges on the forest or the gradual extinction of the permit, because of inability to operate at other seasons. Such a course is not in harmony with any of the three fundamental objectives.

It may be argued that certain winter ranges, of the desert type, are naturally low in productivity and cannot be seriously harmed by overgrazing. It might be claimed that concentrates and other supplemental feeds can be economically substituted for any decline in range forage production. Without going into the merits of such proposals, the fact remains that such stocking must result in excessive demands for summer range. Where national forests include a substantial portion of the summer range the excess stock are crowded on the remaining areas suitable for summer grazing. The result is an overcrowding of outside summer range greatly in excess of what it would be if such crowding also occurred on the forests.

At the present time, 100,000 sheep use public domain winter range in this area for varying periods. If all were on the range for the full five-month season, this would amount to 76,000 sheep. The proper carrying capacity is estimated at 38,000 sheep for five months. Consequently to recognize commensurability for 76,000 would not relieve the shortage of summer range.

Overgrazing of winter ranges may have less effect on the stock, since animals are on a maintenance basis at that time while the summer ranges are used to produce stock for market. A reduction in weight of stock due to depleted summer ranges is therefore more ruinous than a reduction in weight during the winter maintenance period.

Another point is that to accept actual use on overstocked ranges would force every stockman to overstock in order to compete. With prices of private lands and tax rates directly influenced by recognition of such use, it throws a still greater disadvantage on the non-permittee.

Consequently, the proper or conservative carrying capacities of private and other lands must be used to determine the number for which these are commensurate.

To the extent that grazing district licenses are accepted in lieu of leases or other commensurability base, the carrying capacities established by the Grazing Division should be accepted. Since carrying capacities on these lands have not yet been established by that bureau, the figures used in Section IV should be used.

The extensive feeding of concentrates on winter ranges cannot be considered as lessening the amount of range per sheep month as commensurability base. In other words concentrates or other supplemental feed cannot be accepted as part of the commensurability of an operation where it is used to offset a shortage of range or to reduce the number of acres required. To do so would not only continue range deterioration on winter ranges, but would also tend to maintain livestock populations far in excess of the capacity of the summer ranges.

With respect to hay the average ration for the feeding period would determine the number of stock which can be carried. Some men feed a heavy ration while others prefer to rough cattle through on a minimum amount of hay. However, average figures will come close to the general requirement and have been satisfactory in the past. Where hay requirements are decreased through the substitution of grain, there is no logical reason why grain should not be considered to the extent that it displaces hay and to the extent it influences the livestock capacity of the ranch.

Probably the simplest and most direct method is to use acreage and apply average production per acre. Such a method would avoid annual fluctuations in production and could be more easily checked than tonnage of hay and grain. This is a problem in the mechanics of administering a commensurability policy and is merely mentioned as a promising possibility.

Lands to be Commensurate Must be Used as Accepted.
After the rate of stocking and season of use is determined the lands must be used in accordance with the established rate and season. If they are not so used then the object of any commensurability policy is very largely lost. There would still be depletion and instability, and excessive demand because of overpopulated outside ranges would continue. The crowding of outside summer ranges because of restricted numbers on the forests would be the same.

A number of cases might be cited. One range entirely commensurate for the 4,200 sheep permitted was used by 14,000 sheep during the spring and after the summer season began. This range is severely depleted. In another case an upland pasture with a carrying capacity of 450 cow months was used by 150 permitted cattle plus 90 non-permitted cattle, for 6 weeks in the spring and by 90 for 5½ months additional during the summer. Numerous other cases might be cited. Such use is not in harmony with good range management and should not be recognized.

The permittee should state the use to be made of each resource used as commensurability base under normal conditions. The continuance of the permit ought to be based on the continued use of lands in accordance with the agreement.

In developing commensurability ratings in the past, control of summer range has not been considered. It was regarded as supplementary to forest range and therefore not considered in the rating. Actually, to balance the resources within a region or dependent area the control of summer range should be considered and to effect a balance it should be deducted from the required forest permit. As an example, an operation which is commensurate for 3,000 sheep for nine months and owns summer range for 1,500 for three months is dependent for 1,500. If total stocking is ignored or if the summer range is ignored and they are given a permit for 3,000, frequently the rancher will acquire 1,500 more sheep to stock the summer range and overstock winter resources to this extent. By means of a work sheet or agreement provision could be made against such possibilities.

Should Commensurability be Based on Permitted Numbers or Total Stock Owned?

In the past permittees have been required to own sufficient commensurate property to provide for the number of stock under permit. Many of the complications mentioned arise from the fact that while the operator may be entirely commensurate for the permitted stock, there has been no restriction on the use of these resources by other non-permitted stock. A policy requiring adequate commensurate property for all stock owned would overcome some of these difficulties and might go a long way toward correcting overgrazing and land abuse.

The main arguments against it are that it cannot be applied to non-permittees, placing these in a position where additional profits may be made, at least temporarily, through overstocking. It would require an undue amount of supervision and might lead to the regulation of other ranches than those affected by the permit. However, in order to accomplish the proper use of the lands upon which

the permit is based the permittee should show that other stock is provided for adequately within these limitations. Only permitted numbers should be considered.

Summary: A Commensurability Policy:

1. Commensurability should be based upon actual requirements of feed or forage in the locality.
2. Crops not used for livestock in the balanced year round operation are not to be considered.
3. All crops, feeds or forage acceptable as commensurability base are to be considered at the rate to which they contribute to the year round operation.
4. An operation should be commensurate for the entire period the stock are off the forest. If commensurate for fewer stock during the critical period the commensurability during the critical period to govern the maximum for which the operation is commensurate.
5. Substantial ownership should be a prerequisite but some leased property, grazing district licenses or permits, or other form of control to be acceptable to fill out the entire period. In the Yampa area 50 per cent ownership should be required. This to vary with localities.
6. Amount of commensurability to be based on the actual and true carrying capacity of the feeds and forage acceptable.
7. The ownership or secure control of summer range reduces the amount of dependency to that extent and should be considered in the balanced operation.
8. Commensurate lands should be used as accepted. The use of commensurate lands by other stock cannot be allowed.

Suggested Standards for Computing Commonsurability

Routt - White River National Forests

* Based on average figures used in the report.

	<u>Cow Month</u>	<u>Sheep Month</u>
Shadscale type	15 S.A.	3 S.A.
Sagebrush	13 "	2.6 S.A.
Pinon-juniper	18.6	3.7 S.A.
1/Mt. Bruhn-Aspen Summer range	4.2	1.0 S.A.
1/Mt. Parks	3.8	.95 S.A.

Hay. - Average ration 800 lbs. C.H. 90 lbs. S.H.

To be adjusted with locality according to amount used in average feeding season.

Crop aftermath.-Hay meadows.-On basis of length of season they will support a specified number of stock.

Grain.-To be allowed only to the extent that it displaces hay. 100 lbs. grain per cow month seems to be about the maximum. This reduces hay requirement about $12\frac{1}{2}$ per cent.

TYPES OF LIVESTOCK PRODUCTION ORGANIZATIONS

The question is occasionally raised as to the relative economic and social merits of systems of management where resources are used by corporations or individuals with large outfits as compared with smaller family-sized outfits owned by individuals or co-partnerships.

Beginning with the individual, the prevalent types of organizations for the production of livestock are included in the following:

- Business owned and operated by an individual.
- Father and son.
- Father and several sons.
- Two or more brothers--A division of management.
- Two or more brothers--A division of lands.
- Family corporations.
- Co-partnerships--No family relationship.
- Corporations.

The large holding company type of organization seldom invades the livestock production field.

As a basis for the analysis of the corporation or partnership type of organization, seventeen corporations which hold grazing permits on the forests in the Yampa River area were selected for study. Six of the seventeen corporations were strictly one-family organizations.

1/ Usually not to be considered except as supplementary range. These figures are averages and wide variations occur within types which must be adjusted locally.

It was found that ninety-three individuals owned corporate stock in the seventeen corporations. These stockholders can be segregated as follows:

(1) Heads of families dependent for a livelihood upon the earnings of the corporation. -----22

(2) Stockholders owning one per cent or less of the corporate stock of any corporation. -----24

(3) Stockholders owning from two to twenty-four per cent (usually about seven per cent) of the corporate stock. -----47

Group (2) includes family relatives, bankers and lawyers holding corporate stock in order to meet the legal requirements as to the minimum number of people required to form a stock corporation.

Group (3) includes heirs and relatives who may be dependent for a living on dividends or who may own stock merely to provide a minor independent income. This group also includes business and professional men--the investor group.

In 1936 the seventeen corporations held national forest grazing permits for 65,304 sheep. This was an average permit of 2,968 sheep for each of the families in group (1).

Interlocking ownership of corporate stock occurred among eight of the seventeen corporations. In six cases only a small amount (one to eight per cent) of the corporate stock of more than one corporation was held by one individual. One individual, a banker, held a small amount of stock in five of the corporations.

In another instance the major stockholder owned 61 per cent of the shares of one corporation and 44 per cent of the shares of another. The remaining shares of stock in both corporations were held largely by the same group of stockholders. Each of these two corporations held national forest grazing permits in 1936 for the maximum limit number of sheep.

Conclusions:

s (1) Various types of livestock production organizations exist because of the limitations of managerial ability, because of real or imaginary economies, because of the possibility of stability through financial control, or merely because of a personal preference. There is as much justification for livestock producers to organize corporations and part-

nerships as for the automobile manufacturers or the fruit producers. There are certain advantages in corporate organization. Management of a resource may continue indefinitely without the difficulty of conveying real property from person to person. A succession of individuals does not affect the objects of management. Partnerships permit pooling of resources and division of management responsibilities.

(2) The economic merits of one of the methods of operation as compared with some other one seems to have no relationship to distribution policies, except in connection with limits. This relationship may be illustrated by taking as an example a maximum limit established at or near the "economic unit"--the number of livestock which will return a reasonable family income. With this maximum limit in mind, assume that two brothers have entered into a partnership to manage one livestock operation. One man handles the livestock, he being especially adapted to that type of work. The other markets the product, negotiates loans and manages the business phase of the venture. When the maximum limit is applied to that partnership the business can no longer be operated since the income will be sufficient for only one family. This may force a dissolution of the partnership in order to escape the maximum limit restrictions. Such a dissolution is often contrary to the dictates of good management.

The example may be applied to any combination, including the corporation which supports several families.

(3) Corporations and partnerships are usually in a position to command better financial arrangements and managerial counsel than the individual. In determining policies for the distribution of grazing privileges it therefore seems advisable to provide a measure of protection for the individual and at the same time insure equitable distribution for the corporation or partnership. As concerns the maximum limit this can be accomplished by basing the maximum limit on the needs of the one man or one family livestock outfit. When the maximum limit is set at approximately the number needed to provide an adequate family income, the corporation or partnership can be placed in an equitable position by authorizing the Regional Forester to waive the maximum limit in multiples thereof, according to the number of families deriving their principal livelihood from the earnings of the operation.

(4) Considering the merits of the different types of organizations from a social standpoint, the maximum limit again seems to be the important factor. If this limit is applied so as to insure a reasonable distribution of the grazing privilege, there will be little difference in the results, as concerns equitable opportunity, between an operation by an

individual and one by a combination of owners.

The data considered indicates that there is no great difference, among various types of organizations, in the amount of labor employed per animal unit. The problem of the social status of the employee cannot be solved through distribution policies. This is a labor problem.

(5) The object of the maximum limit will be defeated if interlocking ownership of shares of stock is ignored. The present provisions of the grazing regulations provide for adequate safeguards. These restrictions should be applied to all combination ownerships.

POSSIBILITY OF AID FOR SUB-MARGINAL OPERATIONS

The gross value of products produced on all farms, according to the 1930 census, was under \$600 on 27 per cent of the farms and under \$1,000 on 42.5 per cent of all farms. These low values, indicating low incomes even in the prosperity year, 1929, and probably too low living standards, have caused much concern. Indeed, as one official has stated, "We have passed from the stage of development and exploitation of resources to the stage of development and rehabilitation.... There is the same pressing need for conservation and rehabilitation of human resources that we find in physical resources.... The tragic inequality of distribution of natural resources..... must give way to a planned economy which will afford all citizens an opportunity to make an adequate livelihood.... Public agencies responsible for economic and social planning must deliberately assist underprivileged citizens to attain an adequate standard of living...."

The foregoing is quoted to indicate that there is one school of thought which emphasizes the sociological aspects of the distribution problem; another stresses the economic aspects. Since under the weight of all available evidence, this report stresses and builds up its conclusions on economic bases, it seems proper that the sociological view should be presented and its possibilities explored.

Two-thirds of all sheep owners in the area, or 194 out of 285, own less than one band. (See Table 1) Eighty-five per cent of these small sheep owners do not have national forest grazing permits. Nine-tenths, or 1,114 out of 1,243 cattle owners have less than 100 head; and 91 per cent of these do not have permits. 1,259 out of 2,256 farms in the area have less than ninety acres of crop land. While there are exceptions, as pointed out in Section III, most of these units are inadequate. In fact, most of them will earn the operator less than going wages of \$50.00 per month, with nothing to apply on the investment. Obviously, it is this class with which the sociologists are concerned. Provision for a more abundant livelihood should be made. That cannot be questioned.

However, the natural forage resource on all lands is strictly limited. Except through temporary reduction in stocking and through range rehabilitation, the carrying capacity cannot be greatly increased. Furthermore, forage is a waste product which can be turned into cash only through utilization with stock. Since the resources of this area, with the exception of hay and other stored feeds, and national forest ranges, are generally overstocked, the number of stock must be sharply reduced and fewer stock, with a small cash return must be the result. Consequently, either fewer

families may be expected to make a satisfactory living or the general living standard must be reduced. The sociological argument is to limit the amount of resources available to any one person, to avoid one person's acquiring wealth while others are less fortunate. A survey of figures on number of farms, livestock population and distribution as well as carrying capacities, indicates that if such a leveling off process were carried through to a socialistic conclusion, the income of those in the lowest brackets might be increased, but actually the entire rural population would be on a subsistence basis.

After all, only national forest permits and numbers could be manipulated by the Forest Service. Confining ourselves to the forests, there are in the area, twenty-one permittees who own more than 2,000 sheep. If all permits in the area were reduced to a maximum of 2,000 head, range for 38,265 sheep would be made available. This would provide range in one band units for thirty-six owners or only 18 per cent of the present small operators, or it would furnish range for less than 200 sheep to each of those operators--a number from 150 to 500 per cent too small for a satisfactory minimum unit. If all permittees owning over 100 cattle had their permits reduced to a maximum of 100 cattle, range for 3,557 cattle would be made available. One hundred cattle are admittedly too small a unit for an adequate income from a range-cattle enterprise. Fifty-six permittees would be made sub-marginal and only thirty-five new ones could be accommodated on a basis below the desirable minimum or each of the small operators could be given a permit for three cattle.

The indication is that the amount of national forest range available to any one individual or group, can and should be limited to some extent. However, the amount of range so secured which can be made available to smaller operations will not be sufficient to solve all of the low income problems in the area. It cannot aid but a very few of the smaller operations.

Also it should not be presumed that national forest grazing offers the only opportunity to earn or increase one's livelihood. There are possibilities in other directions which can and must accomplish far more than the forests can ever hope to accomplish. After all, it must be remembered that national forest boundaries have been pushed back until the range is confined to the rougher lands which are extremely difficult to use, except by experienced operators, and which support but a limited number of livestock.

The question arises, "Should forest grazing privileges be widely distributed to aid the maximum number of low-income operations or should they be more restricted to a smaller number of more substantial outfits?" To give each operator a permit for 200 sheep or three cattle might aid each one to some extent, but it would so dissipate the benefits that it is doubtful if any of these new permittees would be aided enough to make a material difference. Certainly, it would withdraw range from the satisfactory outfits, with the result that some of these would become sub-marginal. Many of them would be liquidated, others reduced in size. The result would be the discharging of herders and riders, by the employer class, probably with a loss which would offset any benefits to the smaller operators. Another angle is presented in the "Permit Turnover Study," which indicates that the smaller permits are decidedly unstable. The drastic reduction of permits to a great number of small outfits would lead to instability and only transitory benefits to individuals. History indicates that it would lead to an unsettled condition, harmful to other activities and industries which benefit from agriculture and would harm conservation efforts through the constant necessity to deal with new operators and new permittees.

The only logical conclusion seems to be to work toward a distribution policy which will prevent undue monopoly and which, instead of dissipating its benefits over a very great number of very small farms and ranches, will go as far as it can, within its recognized limitations, to stabilize on a satisfactory income basis the greatest number of sound and enduring livestock operations. Such permits should tend toward a minimum size great enough to allow the operation of an economic sized unit, and of a maximum size small enough to permit a reasonable distribution consistent with the economic requirements of the industry and without jeopardizing the stability of the industry or the community structure dependent upon it. Between the minimum and maximum should be a range adequate to allow for certain operating economies, the variations in ranch properties and sizes, and a reasonable margin for expansion and the reward of personal initiative and managerial ability. Such a policy must be based largely on economies.

The salvation of the low-income outfits is one which cannot be effected by the Forest Service alone. It is a case of too many people for the available resource--a situation similar to that in many western stock-raising communities, which must be attacked on a very broad basis.

In addition to the low-income ranch units, there are other classes with bare subsistence incomes. In this area, the coal miners, who are employed only part of the year at a

rather low wage, might be cited. It has been suggested that forest grazing resources might be used to aid such groups, by providing grazing for a few head of livestock kept in connection with part-time subsistence farms. The absolute futility of such a procedure has been indicated above. Such a suggestion cannot be considered when it is possible to take care of only a small fraction of the demand originating from those gaining their livelihood solely from agriculture and grazing.

THE USE OF NATIONAL FOREST RANGE TO PROVIDE A SOURCE OF INCOME FOR FAMILIES OR FOR OTHER PURPOSES

It has been shown and reiterated in all portions of this report that the pressing need is first for proper stocking and the correct, integrated use of all agricultural resources, including forest range; and secondly that the forest range resource is entirely inadequate to provide for an increased income for the large mass of low-income units in the area.

The first essential is to restore and preserve the range by halting overgrazing and the crowding of more stock into the unit. If this is not done, it will bear repeating to state that the ultimate end will be a declining number of stock and fewer units, or a greatly lessened income from stock. For this reason, it has been repeatedly emphasized that permittees must have adequate commensurate property, that the permit must be based primarily on the extent and use of such commensurate property, and that forest range must be made available, so far as possible, to round out such units into balanced operations. This basic problem and its solution is one of conservation of resources and relates only to the social problem insofar as the proper use of those resources can be made to increase the incomes of many more than just the few livestock units which need range. It affects the merchants, bankers and service groups just as much as it does the rancher. To base a distribution policy on the sole premise that range must be made available to family ranch units, and to ignore the fact that these units might or might not be able to provide for such numbers of stock, is to ignore the entire economic as well as the ultimate social effects of such a policy.

The competition for range and the fact that under a strict "laissez faire" policy it might eventually be controlled by a few strong outfits is recognized. To prevent such a condition, a maximum limit is recommended, and it has been suggested that this limit be low rather than too high. This will permit as many as possible to share in the range with such leeway as is needed to provide for variations in operations. To this extent, then, the forest range privileges

will be allotted so as to provide for sound operations without monopoly. Such a policy will provide for the maximum number of satisfactory operations, each with a possible income adequate to provide a reasonably good standard of living. Such a policy will do more for the entire community than a wide dispersal of smaller permits not backed by a strong common-surability policy.

A second consideration is: To what extent should forest range be used for purposes other than contribute to dependent ranches? This may be best answered by considering each possible use separately.

(a) Commercial Use. By commercial use usually is meant the holding of a ranch as an investment rather than as the chief source of family livelihood. It involves a profit on capital rather than an individual operation of the unit.

Commercial use and individual use have so many points in common that a clear distinction between the two is impossible. It will be limited by the maximum limit to about a reasonable income from any one outfit. Beyond that, it is impossible to go without providing a confiscatory policy, which would invalidate a permit, when, through waiver, it passes from an individual operation to a commercial operation.

Recreation. Only on areas where intensive demand justifies such action, will livestock grazing be prohibited. Such areas will be chiefly on summer home areas or camp grounds, along highways or on scenic areas where grazing may be hazardous or of small consequence in most cases. Such restricted areas will, for the Region as a whole, involve only a small amount of usable range. They will be determined on the basis of demand and a proper harmonizing of the two interests.

Wildlife. Certain areas are of especial value for wildlife because they contain the only suitable wildlife range in the locality or because they are concentration grounds, usually at certain seasons.

In cases of such intensive wild life use, livestock grazing may need to be restricted or prohibited to provide for the maintenance of a reasonable amount of wildlife. Where the use by wildlife is extensive rather than intensive ordinarily wildlife can use the same range with stock to the extent that suitable cover and forage for the particular species is available, and restrictions on the numbers of stock are unnecessary, except as dictated by proper range management.

Watersheds. Ordinarily, when the range is properly grazed, maximum watershed values can be maintained. Only in certain cases as on easily eroded slopes, in areas where a small amount of grazing interferes with highly valued watersheds, or on certain municipal watersheds where sanitation is of utmost importance, will it be necessary to restrict or eliminate livestock grazing. This is a question which must be settled locally by considering all of the factors in each case separately.

Timber. Restriction or elimination of grazing will be necessary only on plantations or where grazing is injurious to young reproduction. Such areas are very limited in extent.

BOUNDARIES OF POLITICAL UNITS

So far as the authors are aware, county lines have never seriously influenced distribution policy. It may so happen that dependency zones coincide with county lines. These have not been established to purposely give greater preference to permittees or applicants operating in a certain county. This is true in spite of the fact that tax rates may vary considerably between adjacent counties and the allotment of permits may have an influence on taxation.

A somewhat more serious question arises when residents of one state use national forest range in a second state in competition with residents of the second state. Such a condition exists in this study area, in the case of the Wyoming sheep permittees on the Routt Forest. It also exists on various other Colorado forests where residents of Utah and New Mexico have acquired preferences in Colorado. In most instances such preferences have resulted from use of the range by out-of-state permittees when local demand from within the state was not strong enough to fill the available ranges with livestock. Later, as local demand increased and found the ranges occupied with "foreign" stock, a strong protest has been voiced. The Forest Service has been asked to summarily discontinue these out-of-state permits and re-issue them to local stockmen. Another charge, which is made, is that these out-of-state stockmen do not pay their fair share of local taxes.

The tax situation is discussed in another section of this report.

Dependency does not stop at state lines. Through proximity and continuing use the Wyoming sheepmen have definitely established dependency on the Colorado forest ranges. There is no other available range which these sheep could use if displaced on the Routt Forest. Conse-

quently, the winter ranges of Wyoming are just as dependent on the Routt Forest as are the Colorado ranges. Neither, however, is dependent beyond the carrying capacity of the range, based on proper use. This has been recognized in this study and it is recommended that where established dependency exists on both sides of a state line, such a state line should not arbitrarily be used to give greater benefits to the residents of one state than to those in the other.

The Effects of High Taxes, Distorted Land Values, and Present Grazing Fees.

As indicated in Section III, taxes on private grazing lands are about eight cents per acre. The average base fee for sheep on the Routt National Forest is six cents per sheep month. This is an annual return from land of \$.0633 per acre, figuring an average of .95 acres per sheep month. 1936 fees for sheep were 75 per cent of the base rate, amounting to \$.0475 per acre. Twenty-five per cent of the receipts are returned to the counties in lieu of taxes for road and school purposes. This would amount to \$.0158 per acre under the base fee or \$.0119 under 1936 fees.

It is not to be inferred that this question can be disposed of by the simple statement that the return per acre in lieu of taxes amounts to but 15 per cent of the taxes on private range lands. Considerable grants for highways and for other purposes are made each year by the Federal Government to the public land states. The exact offsetting influence of these grants cannot be determined. Then 10 per cent of the receipts is used directly by the Forest Service for roads and trails. In addition, appropriations are made from time to time for forest development roads which remove that much mileage and expense from the local county road systems. Furthermore, the forests have been of very considerable financial benefit to counties in that they have definitely restricted settlement in the back areas where the cost of providing roads, schools and other services usually exceeds possible tax revenues from these areas for such purposes.

After considering all of these phases of the problem, the fact remains that Federal grants, forest road expenditures and the benefits of restricted settlement are spread more or less equally over the taxpayers, the permittees and non-permittees. A differential which directly affects the county budget remains between forest and private range.

County revenues must be sufficient to meet the cost of government. If one set of taxpayers is able to pay a relatively low rate, some other group must pay a higher rate to provide the necessary funds. Thus, the permittee who pays to the county through grazing fees, \$.0158 per acre or about \$10 per section, may not contribute enough to meet the costs of desirable government, forcing the non-permittee to pay eight cents per acre or \$51 per section to make up the difference. The permittee thus has a decided advantage in not owning or leasing summer range.

One solution is to limit the expenses for government and to effect certain economies as suggested in Section IV, thus establishing more nearly parity between the permittee and non-permittee. That this is desirable is not questioned. However, there is also the fact that roads are poor and many schools are inefficient and inadequately financed, which would argue for increased taxation in order to provide a more "abundant living" for those in the unit. Saunderson ^{1/} states that there is historical evidence that land taxes will usually equal about one-fourth of the land return, or, in other words they will be one-third the amount of interest on land charges. Using this as a criterion as well as the factual information in Section III which indicates that sheep can carry a valuation of \$6 to \$7 and a lease cost of 20¢ to 30¢ per acre, it would appear that a tax of 6¢ to 8¢ per acre of good grazing land could be supported although it naturally reduces the operator's margin by this amount.

Speaking of taxes in the State of Wyoming, A. F. Vass and Harry Peason ^{2/} have this to say: "The people of the State of Wyoming own one-third of the land in the State. The land taxes of the State are carried by this one-third. The high assessed valuation of the land now owned is what discourages further ownership, and leaves the people, who are now land owners, carrying the burden of those remaining areas that are not privately owned. By placing a penalty on ownership of land we discourage the most vital thing in our whole agricultural system."

The argument that the return in lieu of taxes from forest receipts and land taxes should be equalized is most often used in an attempt to show that local stock should be given range on the forests in preference to out-of-state

^{1/} M. H. Saunderson, Montana State College, "Some Material Relating to Livestock and Land Valuation."

^{2/} University of Wyoming Agric. Exp. Station Bul. #156, "Range Sheep Production on the Red Desert and Adjoining Areas."

stock. It is claimed that the out-of-state man pays taxes on the bulk of his plant to support his own state and local government, while he grazes on summer range in another state and returns to that county only 15 per cent of what local residents must pay in taxes for private range, since they cannot secure that forest range. There is some merit to such an argument. The differential could be overcome to some extent by placing the bulk of the taxes on livestock and only a small amount of taxes on private range lands and improvements. Such a course might, however, lead to higher lease costs and land speculation which might nullify any benefits derived from a shift in taxes.

The assertion that the tendency to give preference to sheep over cattle on the national forests has destroyed tax base in private lands and improvements, is not supported by facts. In the first place, national forest range is and should be allotted either to cattle or sheep on the basis of its adaptability to either class. The local forest ranges in main part are best suited for sheep. In the second place, as has been shown, the shift from cattle to sheep occurred because of the economic advantage of the latter, irrespective of the class run on forest ranges. In the third place, sheep, being able to support land values several times as high as can be supported by cattle, can also pay a high tax and with less delinquency. If sheep use pays a lower tax it is a fault in the assessment, not in the ability to pay that tax. In the fourth place, while it may be true that sheep use has resulted in less intensive land use and the destruction or abandonment of improvements and cultivation, such improvements and cultivation must have been economically unsound or they would have endured. Furthermore, such improvements and cultivation may more often be charged off to misguided crop agriculture than to cattle ranching enterprise. A study of these small units and the effect on taxation of their gradual elimination or absorption by sheep outfits does not provide comparable data because of constantly changing assessments and mill levies on the same property. The large amount of tax delinquency and abandoned farms, many of which had small bunches of cattle at one time, cannot be charged against the sheepmen who now use those lands. Rather it must be charged to the land promoters and local boosters who encouraged the farming of land whose highest use is grazing.

Distorted Land Values. Table 9 of Section III indicates that on average, long-time prices, sheep can support a land value of \$7.40 per acre and cattle can support a value of \$2.60 on the basis of earnings of 37¢ and 13¢ per acre respectively. This would indicate that present land values and lease costs on private lands are

about right for sheep. It also indicates that cattle cannot compete with sheep on long-time price levels for both classes and points out why sheep are displacing cattle on the foothill ranges in this unit. However, it will be noticed that the manager's return is set at \$900 for one and two-band outfits and \$1800 for four-band outfits. This is rather low when one considers that this is the return for managing investments ranging from \$25,000 for the one-band units to over \$100,000. If the return for managerial services is raised this would have the tendency to reduce the amount which can be applied to land return. In actual practice, of course, if the operator can get lands more cheaply he increases the amount of income available for himself and his family.

The cost of lands and of leases is established by bargaining. Briefly, it is the amount the owner can get and the amount the purchaser or renter is willing to pay. Consequently, while it is admitted that it would be desirable to reduce land costs, especially so as to permit ranches to compete which must run cattle, such costs are established through the economic law of supply and demand which cannot be changed, unless all lending agencies were to cooperate by refusing loans on high-priced lands. This is considered an impossibility.

Grazing Fees. It is frequently charged, and is so stated in Section III, that fees are too low. Low fees give the permittee an advantage over the non-permittee, assuming that operating costs are about the same. The permittee counters with the claim that operating costs are higher on the forests. This is not the case with sheep, as Section III points out. Also, using figures presented in Bulletin No. 156, of the Wyoming Experiment Station, based on a study of 290,000 permitted sheep and 135,000 non-permitted sheep the same fact is brought out. At 8¢ lambs and 22¢ wool, the return for each ewe on the forest is \$6.45 as against \$5.79 for ewes run on other lands. The carrying costs, \$8.42 per ewe on the forest and \$8.24 of the forest are pre-depression figures. With labor and supply costs much lower now, the difference between these two figures should have a tendency to be narrower. Nevertheless, using those cost figures and average prices, there would be a difference of 48¢ in favor of the permitted sheep, or \$600 per band, or about the amount set up for managerial return in the budgets in Section III.

The national forests in this area contain 37 per cent of the summer range. Each stockman cannot be granted a permit for 37 per cent of his stock for which summer range is available. Permits must be granted for economical units of stock. Consequently some stockmen can be

granted permits while others must be denied to share in the range. The latter insist that they have a right to a portion of cheap public range, that they are in an unfavorable competitive position and that they are being discriminated against.

As an example of how this operates, a rancher with two 1,000 bands of sheep may decide that the net profit permits him to pay \$900 for summer range or 15¢ per sheep month. If he has a permit for one band on the forest and pays 5¢ per sheep month he can lease outside range for the other band at 24¢ per sheep month and stay within his budget. His neighbor with two bands, who is unable to secure a permit, cannot compete. By leasing all private lands, his budget must call for \$1,440 for the same season. Such clear-cut cases actually show up throughout the area. By drastic overstocking the actual cost per sheep month can and is beaten down to 12¢ to 15¢--still 3 to 4 times the present forest fee.

As an actual example, one sheepman pays, at the base rate, 18¢ for a sheep per three-month season or 6 $\frac{1}{2}$ ¢ per acre (2.75 acres per sheep for three months) on the forest. On identical adjacent leased range, producing about the same weight lambs and involving similar handling costs and loss factors, he pays 25¢ per acre or 57¢ per sheep for the summer season or 19¢ per sheep month (2.3 acres per sheep for three months.) Several sheepmen asserted, during the course of this study that the reason they could afford to pay 5 to 7¢ per acre for spring-fall range was because of low forest fees. One cattleman, who insisted he could not operate without a certain forest allotment, which he admitted was not particularly well suited for cattle, stated that if fees were raised he would have no advantage in the use of the forest, and might as well lease private range.

Incidentally, the same factors operate in the case of the so-called "tramp" stockman. Through a minimum investment in equipment and lands, resulting in very low carrying charges during the winter period, he is able to average off costs and pay a higher price for summer range than can the local, established sheepman with a heavier winter carrying charge. In the case of low grazing fees, similar factors are at work. While it cannot be said that Forest Service policies tend to create tramp outfits, they involve similar competitive conditions between the permittee and non-permittee as are in operation between the tramp and the local ranch.

In view of the increased stability offered through the proposed policy such inequalities between the permittees and non-permittees will be perpetuated. Unless it can be adjusted permits will be much more valuable than in the past

and under the waiver and sale procedure will demand a larger premium. Because of their increased value the prospective purchaser may be tempted to pay more than the permit is worth in addition to the intrinsic value of the land or stock. This is more true of a valuable permit than of the present less valuable one. Thus there will be introduced into the waiver procedure evils which may come dangerously close to some of those which are inherent in the competitive bid system.

An analysis of Part 2, Table 1 of the report, shows the following:

<u>Size of Operations</u>	<u>Percent Holding</u> <u>Permits</u>	<u>Percent Stock</u> <u>Permitted</u>
Less than one band	15%	23%
One to four bands	61%	46%
Over four bands	100%	45%

This shows rather definitely that even with the present distribution policy the large operator either finds it easier to get a permit or he can compete with the smaller non-permittees and build up a large-sized operation. He sets the price of outside lands very largely and the small operation, which is not so well equipped to bear risk and fluctuations in costs, cannot compete. It may be expected, therefore, that any policy which tends to continue permits without adjusting inequalities between the permittee and non-permittee will result in complaints and dissatisfaction on the part of the smaller operators and will tend to arouse public sentiment favorable to them.

Since permits now are largely connected with sound and substantial operations and since the proposed policy is expected to continue this trend, within maximum limits, there is an increasing necessity to eliminate inequalities.

Grazing fees ought to be adequate to pay all costs of administration and improvement of the ranges, including amortization and maintenance. Economics would indicate that if fees are set at the proper value of the forage, then administration and improvement costs should be kept down below such a return, except where other public service requirements make it economically necessary to manage affected resources more intensively.

When fees are less than the cost of administration and improvement there is a subsidy provided by all taxpayers, including non-permittees, to allow the granting of cheap range to a few permittees. Moreover, it gives the sportsmen a powerful weapon, as evidenced in several

articles recently published in a national weekly magazine. The sportsman feels that if he contributes to the subsidy of stockmen on public lands, game should have much greater consideration.

In summing up this situation, there is a need to deflate land prices on private lands. Taxes should be reduced. To a certain extent, this might be aided by an increase in fees to the true value of the forage on public lands. The method of determining true value is explained in Section III and involves the amount left to apply on land after all costs, including operators' wages and/or managerial return, are deducted from gross income. True value is not necessarily related to bid value. Possibly, to eliminate inequalities between permittees and non-permittees, there should be some increase in payments to counties in lieu of taxes. Any final decision on this point should be withheld pending the release of the results of a tax contribution study made in Colorado by the Forest Service in 1936. The results are not yet available.

If forest grazing privileges are to be used to assist the very small and often sub-marginal outfits, then there should be no objection to the continuance of low fees. Such a policy would probably be more desirable than a dole to this class. If, as has been expressed in the objectives, the aim is to stabilize the industry and to distribute range to sound outfits, then there seems to be no good reason why such operations should be subsidized nor why they should not pay a fee commensurate with the true value of the range and forage.

DETERMINATION OF QUALIFICATIONS OF APPLICANTS

As stated in connection with the basic objectives and as is brought out in all sections of the report, the problem of distribution is basically one of integrating land use. Distribution primarily involves the granting of national forest range, so far as is possible, for use in rounding out dependent, commensurate operations. If the summer range is adequate to balance all other seasonal feed and forage resources in a dependent area, then there is no distribution problem. Each unit of feed or forage would be the basis for a unit of summer range. This is the only way in which proper use of all resources can be approached.

However, where the forest range represents but a part of the total summer range, and where the proper utilization of all winter, spring and fall resources requires more summer range than can be furnished by the forests,

the problem arises of choosing from among the various applicants, who have dependent, commensurate properties. Various factors affecting dependency have been listed in connection with that subject and it is believed that this is about as far as one may reasonably go in differentiating between various applicants. Beyond that point it is suggested that the choice by lot may be resorted to.

There are, however, certain factors which have been useful in the past and these are here briefly reviewed.

Citizenship has been a requisite to secure a preference under existing policy. There can be no question of the desirability of this requirement. American citizens should not be deprived of range in order to provide for aliens, even though the aliens operate dependent ranches. Intention to become a citizen, which is accepted under the Taylor Act, should not be considered as sufficient to qualify in competition with full citizens.

Ownership of Land vs. Tenancy. Under existing policy, tenants are placed in a separate class and can only be considered when there is vacant range which is not needed by owners. Essentially the same procedure is proposed under the recommended policy, except that tenants are not placed in a separate and distinct classification. The recommended commensurability policy specifies that to be qualified a permittee or applicant must own "a substantial part" of the commensurate lands--50 per cent in the case of this unit. Where vacant range exists which is not in demand to provide for such qualified persons, there is no reason why temporary permits should not be issued to tenants.

Residence on Dependent Property. Under present policy it is necessary to qualify as a Class A, for the permittee or applicant to reside on his ranch property. This was justified, since the resident was considered as being primarily in the livestock or ranching business while the man who lives in town usually has had other interests in addition to ranching.

Under recommended policy this requirement is unnecessary. The dependence and commensurateness of lands are of prime importance and residence becomes much less so. Also, in the interests of community welfare, it is recognized that there are instances when it may be neither advantageous nor necessary to maintain residence on the ranch. Consequently, this requirement will no longer be needed.

Numbers of Stock Owned. At the present time the number of stock owned largely determines the permittee's or applicant's classification. In fact, under present policy,

only the Class A, the man owning less than the protective limit number of stock, can be admitted on most forests. Protective limits are low, except in the case of sheep, where they are most often set at one band. The result is that often only the small homestead type of operation can expect to secure a permit.

The small permits are relatively unstable as shown in the permit turnover study. Moreover, the small outfit very often is too small to be an economic unit. It exists either at a low standard of living for the operator and his family, or it may pass out of existence within a short time. On the other hand, if a minimum limit were set and the operator were required to own more than the specified minimum limit number before being admitted to share in the use of forest range, it would impose a severe handicap on the small man just getting started. It would be necessary for him to own or lease sufficient summer range from the time he began operations until such time as he had sufficient stock to be eligible for a permit.

If the total number of stock owned is restricted, as is the case under present policy, it discriminates against many applicants or permittees who require a fairly large herd to cover a large investment in property, to make use of the products of a larger ranch, or to conduct an efficient operation.

It appears therefore that the number of stock owned has no particular bearing on the relative qualifications of permittees or applicants, and should not be considered in the future.

Classification of Applicants and Permittees. At the present time the difference between a Class A and Class B permittee rests very largely on the relative number of stock owned -- whether that number of stock is below or above an arbitrarily established protective or exemption limit. The foregoing discussion is intended to show that this basis -- the number owned -- is not especially sound under present conditions. There seems to be no need for continuing these two classes. The third classification, Class C, refers to tenants and this classification also need not be retained under proposed policy as discussed in connection with ownership and tenancy.

LIMITS

Present Policies

Under existing policies, distribution is restricted by two limits: the exemption and the maximum. On some forests, a third limit, the protective, is used.

In establishing protective limits, the intent has been to designate the relatively small number of livestock needed for profitable management as a subsidiary enterprise on farms devoted to diversified crops. This limit has been the number of livestock for which the permits of diversified farmers would not be reduced by administrative action for purposes of distribution.

The exemption limit is similar in purpose to the protective limit, except that the need of the rancher engaged primarily in livestock production was the basis for determining the size of this limit. In the absence of demand from the diversified farmers, the exemption limit has not been used. In such instances the protective limit has been higher and served for both purposes.

The maximum limit is the number above which an increase in preference to any permittee may be denied. The purpose is to prevent monopoly or to insure wider distribution of the grazing privilege.

Numbers above the maximum limit have usually been held under temporary permit or, unless the limit was specifically waived, have been subject to annual reductions for distribution. Numbers between the maximum limit and the exemption limit or between the maximum limit and the protective limit have been subject to reductions for distribution; the amount and frequency of reductions depending upon the type of permit held and the demand for range.

Proposed Policy

Under the proposed policy, which discontinues percentage distribution reductions, there appears to be no need for either the protection or exemption limits, since, as has been explained, the purpose of both was to protect the permittee from distribution reductions below certain numbers.

The maximum limit must be continued with the same objectives as in the past. The reason for this is that, irrespective of land values, fees and taxes which are discussed elsewhere in this report, national forest ranges offer certain advantages not found on other ranges. High altitudes, which usually mean relatively higher precipitation

and consequently better forage plant growth, is a physical advantage which will always exist. Other advantages are government constructed improvements of value to the permittee; management of ranges on a sustained yield basis; protection from trespass and similar factors. Further distribution should therefore be as wide as possible, consistent with economic stability. This argues for continuation of the maximum limit.

The real consideration is to find the proper maximum limit. The maximum limit should be high enough to permit an outfit of reasonable size to exist, to permit smaller outfits to enlarge within limits, and it should not restrict an operation to the bare minimum that will just return a living income. It must be recognized in this connection that due to managerial ability, location, type and size, all outfits vary and call for a varied number of livestock in order to meet these conditions.

The maximum limit should not be so high as to give a few operators a virtual monopoly. It should recognize the fact that economy can be achieved with increasing numbers up to a certain point, but this should not be carried so far as to deprive a great number of smaller operators of range in order to allow a few selected ones to run very efficient outfits.

Present maximum limits vary between 1,200 and 6,000 for sheep, and 75 and 1,000 for cattle. The limits in effect are shown in the following table:

Maximum Limits in Effect, Region Two

Sheep

1,200	2,000	2,500	3,000	4,500	6,000
one	one	five	two	two	eight

Cattle

75	200	250	300	350	400	500	600	800	1,000
one	three	two	two	one	four	twelve	two	one	two

The second line in each case shows the number of times each maximum limit is in effect. The fact that there are more cattle maximum limits than there are forests is accounted for by two or more limits on the same forest.

In determining future maximum limits, consideration must be given to certain essential factors.

(1) The established user. Preferences of varying sizes exist. The related livestock operations are tied to investments in property and are more or less in balance as to seasonal feed requirements. Such operations cannot be broken up on short notice without serious financial losses. A maximum limit must therefore be based on the size of existing preferences for application to established users. A fair and reasonable procedure seems to be to apply existing limits to this group. When a higher maximum limit is established to apply to new applicants the established permittee should be allowed to build up to the higher number by methods proposed in the new distribution policy. Where a lower maximum limit is set up for new applicants the established permittee should be allowed to retain an existing preference at any number between the new limit and the old one until the close of the present term permit period--1944. Permittees should be notified of this policy and informed that renewal of the permit in 1945 will be subject to the new maximum limit restrictions. Meanwhile, they may, if desired, dispose of surplus numbers under the provisions of the proposed distribution policy.

(2) The future permittee. Obviously a different maximum limit may be applicable to this class because dependency has not been established through use. There is then the question of size of the unit to be provided for.

In favor of a low maximum limit it may be said that it will allow for a wider distribution of privileges and a greater sharing in the forest range. It will restrict the extent to which purchase and waiver may be resorted to in order to eliminate smaller owners and build up a few strong outfits. It will distribute more widely, any advantages in the use of forest ranges which may exist. It should provide more range for the small diversified or winter-feeding operation as against the usually larger range outfits. If a leveling off process occurs, due to gradual elimination of the smaller operations through purchase and waiver, such a level will be lower with a low maximum limit, assuring a wider distribution of privileges five, ten, or twenty years hence.

In favor of a high maximum limit, it may be stated that it will promote more efficiency in the average outfit and will provide for a greater number of efficient outfits, on the basis that high efficiency is attained at two or three bands and continues to four to six band outfits and in similar proportion with cattle operations. A high limit will provide more opportunity for growth and should stimulate initiative and good managership. The Forest Service will have fewer outfits to deal with, resulting in less administrative work and an easier opportunity to secure proper

range management on forest ranges. The larger operators will have more at stake and, if judged by past experience, will, as a whole, take a greater interest in the range and in range management. The larger operators, too, will generally speaking, be livestockmen and not farmers, who run livestock as a side-line with farming as their main interest. Then, too, higher limits will more adequately protect the investments in plant on the the part of the larger outfits and such limits will, through assurance of range for larger numbers, probably make for better loans.

The establishment of a maximum limit is for the purpose of preventing monopoly in the use of a public resource. Such a monopoly exists when a few individuals control relatively large permits to the extent that the owners of other equally dependent properties cannot share in the use of the range.

The underlying base upon which permits are issued is dependent, commensurate land. The amount of commensurability furthermore is the measure of the proper carrying capacity of dependent lands. Since the carrying capacity of all dependent lands in this area now used for the production of sheep, almost exactly equals the carrying capacity of the forest summer sheep range, such monopoly cannot occur, since each and every unit of outside resources would be balanced by a unit of national forest range. One of three things might happen to upset such a balance: The spring-fall-winter carrying capacity might be increased through wintering more sheep on hay; there may be an increased shift from cattle to sheep, involving a shift of commensurate lands from cattle use to sheep use; or lands not now dependent might be considered dependent. If any of these three conditions do not take place then the placing of an arbitrary maximum limit will deny some sheep, for which adequately commensurate land is owned, a share in the range. It would, if the commensurability policy is strictly applied, create a vacancy on the forests, unless commensurate lands above such a limit are sold to new operators. A maximum limit so applied would not operate to restrict monopoly on the forest as much as it would operate to prevent a monopoly in the ownership or control of outside lands which can be used as base for a permit.

In the case of cattle permits the situation is different. There appears to be nearly adequate commensurability for the 50,000 range cattle now in the area. There is available, however, national forest summer range for only 13,000 cattle. As has been explained, a permit for a portion of each operator's herd, based on the proportion of summer range to dependent, commensurate property, is not practical. The next possibility would be to eliminate the

sub-marginal operations from consideration and apply a maximum limit at a point where the remainder could share more or less equally in the range, placing the limit so that the largest permits would be limited to such an extent as to prevent monopoly and exclusion of smaller permits.

The difficulty in determining the effect of such limits lies in the ability to determine existing commensurability in accordance with the new policy, not only of present users but also of potential applicants. Furthermore, it is considered that the recommended commensurability policy cannot be applied to present permittees for the remainder of the ten-year term permit period, except in connection with action on requests for increases or in determining reductions within the limitations of the present policy. The recommended commensurability policy can and should be immediately applied to all new applicants. A maximum limit must, therefore, be determined for new permittees and applicants. Such a limit may best be based on economic considerations. Meanwhile, the possibility of a limit based on the proportion of commensurability to forest range can be studied, after the effects of other phases of the new policy become apparent.

Using the information in Section III of this report, it seems that a maximum limit of 2,000 sheep, in the case of new permittees, will allow for a reasonable income. In the case of cattle, because of their inability to pay the same rate on the investment as sheep, it appears that it would require between 700 and 1,000 cattle, depending on conditions, to secure a return comparable to that received from 2,000 sheep. Since the amount of cattle range is limited, it is suggested that the present limit of 500 head on the Routt and 600 on the White River be retained for both old and new users.

(3) The individual as compared with the corporation or partnership. The merits of different types of livestock organizations have been discussed. One of the conclusions drawn was that equitable treatment indicated the need for waiving the maximum limit in multiples thereof, depending upon the number of families obtaining their principal source of livelihood from the earnings of a partnership or corporation. This policy of waiving the maximum limit is to apply to new corporation or partnership permittees. When, at the future date stated under (1), all permittees on a grazing unit are subject to the same maximum limit, a uniform policy should be applied. For the present the new maximum limit would be the number waived. The total number to be allowed any one corporation or partnership should usually not exceed the limit to which established permittees are now subject. In the Yampa River unit, this would be three times the proposed new maximum limit.

Waivers of Preference

At the present time, waivers of permits may be accepted when they accompany the sale of ranch or stock or both.

Where a dependent ranch property is sold, there can ordinarily be but little question as to the validation of the waiver and the granting of a permit to the purchaser. Nearly always the use of forest range has become an accepted part of the operation and the value of the ranch might be greatly depreciated if the purchaser found it necessary to begin management of the property without summer range. The same holds true where the operator may desire to start his son in the livestock-raising business or where the ranch passes on through inheritance. The addition of livestock to the ranch (a ranch and stock waiver) does not alter this condition. In a few instances preferences may have been acquired in a spirit of speculation, in order to enhance the sale value of the ranch, without any real need for forest range. Such cases should be largely controllable under the suggested commensurability policy.

A waiver with the sale of livestock only is a somewhat different matter. Ordinarily, the ranch owner--he would need to own commensurate and dependent property to be eligible for a permit--buys the stock and secures a waiver in order to be assured of range without facing the uncertainty and competition in applying for a permit in the regular way. The seller, on the other hand, is able to place a higher value on the stock by reason of the permit. Otherwise he could sell to anyone at the market price. According to various estimates of livestockmen and bankers, the forest preference appreciates the value of sheep from one dollar to five dollars per head. Cases are known where waivers were given with old sheep, many of which were pelted soon after the sale. In other cases, the waiver procedure seemed to involve a bill of sale to the second party, while the cattle were shipped to market.

There are opposing arguments over waivers with the sale of livestock. In favor of continuing such waivers, it might be said that a preference has tangible value and if a waiver is more or less automatically accepted it can be sold for a cash consideration. Whether that price is included in an appreciated price on the stock or is charged for separately does not matter a great deal. The restriction that waivers of preference cannot be sold outright but must be accompanied by the sale of the livestock, prevents speculating in preferences to some extent. The acceptance of waivers with sales of stock permits, in effect, the

sale of the preference and new distribution of privileges is on a business basis. The seller gets a cash return for the surrender of a valuable preference, the buyer is assured of range, the disappointed applicant who hoped to get the range has only himself to blame for failing to purchase, and the Forest Service is saved the work and worry of deciding upon the proper and equitable distribution of the vacated range. If a rancher with sufficient commensurate lands needs a larger permit, why not permit him to buy from someone who is willing to discontinue? Why force him to buy lands which he does not need? This is the reason for waiver with stock only.

In opposition it may be said that a privilege in the use of public owned lands should not be made the basis of speculation or private gain. If preferences are readily salable there may be a tendency to acquire permits as a speculative proposition, so far as permissible under commensurability policy and it may involve a demand for permits on established permittees, rather than on the government, enhancing values still farther and possibly introducing some of the evils of the competitive bid system. There is also the feeling that if future distribution is placed on a sale-and-waiver basis the stronger operators will gradually purchase the weaker outfits, with the result that eventually there would be a minimum number of permittees each with a permit for approximately the maximum limit number. This argues for a low maximum limit. It is felt that by limiting waivers to the sale of ranch property only, this can be more effectively avoided since the restriction would be more severe. This might provide for a higher maximum limit without so much danger of concentrating permits eventually in the hands of a few.

The proper disposition of this question cannot be decided on the basis of facts presented in this report. Rather, it rests on what distribution theory should be adopted. If future distribution will be largely on the basis of purchase and waiver, it seems that the maximum limit should be low. If purchases are definitely restricted and some slack becomes available from time to time, through the discontinuance of permits, then there will be some distribution by the Forest Service and some opportunity to provide for such new applicants as cannot compete for permits with the stronger outfits.

Since the present waiver policy is, on the whole, satisfactory, it may as well be continued. Reductions when transfers are made should be limited to those needed for protection, except where cuts for distribution can be used to get existing large permits down to approach the recommended maximum limit.

A P P E N D I X

BASIC DATA USED IN THE REPORT

TABLE A

AREA OF THE YAMPA RIVER UNIT, COLORADO

The total area of all lands is 4,288,261 acres. This may be divided on the following bases:

<u>Division Among Political Units:</u>	<u>Acres</u>	<u>Per Cent</u>
Routt County	1,319,622	30.8
Moffat County	2,712,678	63.3
Rio Blanco County	212,031	4.9
Garfield County	35,328	.8
Grand County	8,602	.2
	<u>4,288,261</u>	<u>100.0</u>

Division on Basis of Ownership:

Privately Owned Lands	1,600,128	37.3
State Owned Lands	281,164	6.5
Government Lands:		
Within Routt National Forest	551,531	12.9
" White River National Forest	193,817	4.5
" Taylor Grazing District #1	339,743	7.9
" " " " #6	1,191,169	27.8
" No Grazing District	130,709	3.1
	<u>4,288,261</u>	<u>100.0</u>

Division on Basis of Present Use:

Dry Farm Land	96,349	2
Irrigated Farm Land	54,838	1
Summer Pasture	2,033,560	47
Spring-Fall Pasture	1,523,628	35
Winter Pasture	579,886	14
	<u>4,288,261</u>	

Privately Owned Lands:

Routt County:	588,850 acres
Timberland	12,702 acres
Dry Farmed Lands	44,116 "
Irrigated Lands	39,117 "
Summer Pasture Lands	492,915 "

Moffat County:	960,230 acres
Dry Farmed Land	41,442 acres
Irrigated Lands	13,213 "
Dry Land Alfalfa	6,009 "
Natural Hay Lands	3,863 "
Summer Pasture Lands	258,339 "
Spring-Fall Pasture Lands	607,214 "
Winter Pasture Lands	30,150 "

Rio Blanco County:	51,048 acres
Dry Farmed Land	919 acres
Irrigated Lands	2,508 "
Summer Pasture Lands	47,621 "

Total	1,600,128 acres
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State Owned Lands:

Routt County	Summer Pasture Lands	67,078
Moffat County	Summer Pasture Lands	28,095
" "	Spring-Fall Pasture Lands	149,696
" "	Winter Pasture Lands	36,295
		<u>281,164</u>

Government Owned Lands:

Routt National Forest	Routt County	504,605
" " "	Moffat County	38,324
" " "	Grand County	8,602
White River National Forest	Routt County	17,103
" " " "	Moffat County	3,657
" " " "	Rio Blanco County	137,729
" " " "	Garfield County	35,328

Total National Forests	745,348
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Grazing Dist. #1, Moffat Co., Summer Range	111,956
" " " " Spring-Fall Range	184,178
" " " " Winter Range	22,675
" " " , Rio Blanco Co., Summer Range	20,934

Grazing Dist. #6, Moffat Co., Summer Range	101,068
" " " " Spring-Fall Range	582,540
" " " " Winter Range	490,766
" " " Routt Co., Summer Range	16,795

Public domain not in a graz. dist. Routt Co.,	
Summer Range	125,301
" " " " " Rio Blanco Co.,	
Summer Range	2,320
" " " " " Moffat Co.,	
Summer Range	3,088
Total Public Domain	<u>1,661,621</u>

Source - The basis for the above areas is the actual 1935 status as recorded in the assessors' offices in the various counties involved. Complete graphic status on the scale of one inch to the mile and giving the ownership of individual tracts is available in the Forest Service files, as well as a compilation by townships of the class of ownership, number of farm units, and use to which the lands are put.

Conversion Factors Used in Converting to Cow Months

Animal months have been converted to cow months on the following bases:

On hay and grain, 6.6 sheep months equal 1 cow month.
On summer forage, 4 sheep months equal 1 cow month.
On spring-fall and winter forage, 5 sheep months equal 1 cow month.

The ratio is lower on summer forage than on spring-fall and winter forage because of the presence of the lambs in the summer and on account of the different types of feed involved.

$1\frac{1}{2}$ elk months equal 1 cow month.
4 deer months equal 1 cow month.
4 mountain sheep months equal 1 cow month.
4 antelope months equal 1 cow month.

Livestock Population

The number of horses was estimated on the basis of the 1935 census totals. In Moffat County the entire number was included since a negligible amount of farm land is outside the area. In Routt County, 92.4 per cent of the total number was used since that proportion of the total farmed land in the county is within the unit boundaries. In Rio Blanco County, 3.8 per cent of the Routt County number within the area was used since the areas of cultivated land for the parts of the two counties within the area are that proportion.

Since specific information as to the division of cattle use between various foods and ranges, other than the national forest ranges, was lacking, the division was made on what seemed to be the most logical basis.

Table B indicates the numbers and distribution of the above classes of livestock.

TABLE B
PRESENT USE BY COUNTIES AND BY CLASSES OF OWNERSHIP

	Summer			Spring-Fall			Winter		
	Sheep	Cow	Total in	Sheep	Cow	Total in	Sheep	Cow	Total in
	Months	Months	Cow Mo.	Months	Months	Cow Mo.	Months	Months	Cow Mo.
Private Lands:									
Routt Co.-Hay & Grain							183820	220238	248090
-Crop Aftermath				26774	25592	30947			
-Pasture	154194	137959	170508		35000	35000			
-" (Elk & Deer)			2200						
-Total	154194	137959	178708	26774	60592	65947	183820	220238	248090
Moffat Co.-Hay & Grain							107230	86468	102207
-Crop Aftermath				12425	10000	12485			
-Pasture	151000	36462	74212	138493	5156	32855	8578	4568	6283
-Total	151000	36462	74212	150918	15156	45340	115808	91036	108490
Rio Blanco Co.-Hay & Grain							23900	11731	15352
-Crop Aftermath				4460		892			
-Pasture	120000		30000						
-Total	120000		30000	4460		892	23900	11731	15352
State Lands:									
Routt County - Range	100000		25000						
Moffat County - Range	19000	5000	9750	34623	14926	23582	3847		769
Total	119000	5000	34750	34623	14926	23582	3847		769
Federal Government Lands:									
National Forest:									
Routt National Forest	332274	30716	113784						
" Elk & Deer			7600						
White River N. F.	120761	32019	62209						
" Elk & Deer			250						
Total of National Forests	453035	62735	183843						

TABLE B

	Summer			Spring-Fall			Winter		
	Sheep	Cow	Total in	Sheep	Cow	Total in	Sheep	Cow	Total in
	Months	Months	Cow Mo.	Months	Months	Cow Mo.	Months	Months	Cow Mo.
Public Domain:	:	:	:	:	:	:	:	:	:
Grazing District No. 1	:	:	:	:	:	:	:	:	:
Moffat Co. Range	36000:	40000:	49000:	8000:	23000:	25738:	70964:	1408:	15601:
" Elk & Antelope	:	:	:	:	:	4082:	:	:	:
Rio Blanco Co. Range	:	5017:	5617:	8686:	3970:	6141:	:	:	:
Total	36000:	45617:	54617:	16686:	26970:	35961:	70964:	1408:	15601:
Grazing District No. 6	:	:	:	:	:	:	:	:	:
Moffat Co. Range	80000:	8000:	28000:	58068:	58523:	73042:	450000:	3000:	93000:
" Elk, Mt. Sheep,	:	:	:	:	:	:	:	:	:
Deer & Antelope	:	:	4482:	:	:	7500:	:	:	4982:
Routt Co. Range	31000:	:	7750:	:	:	:	:	:	:
Total	111000:	8000:	40232:	58068:	58523:	80542:	450000:	3000:	97982:
Not Included in Grazing D.	:	:	:	:	:	:	:	:	:
Routt Co. Range	140000:	:	35000:	:	:	:	:	:	:
Rio Blanco Co. Range	5000:	:	1250:	:	:	:	:	:	:
Moffat Co. Range	3000:	500:	1400:	:	:	:	:	:	:
Total	148600:	500:	37650:	:	:	:	:	:	:
Grand Totals by Counties:	:	:	:	:	:	:	:	:	:
Routt Co.	757468:	168675:	358042:	26774:	63592:	65947:	183820:	220238:	248090:
" Game	:	:	9800:	:	:	:	:	:	:
Moffat Co.	239600:	89962:	162362:	291529:	111605:	167702:	640619:	95144:	217860:
" Game	:	:	4482:	:	:	11582:	:	:	4982:
Rio Blanco Co.	245761:	37636:	99076:	13146:	3970:	7033:	23900:	11731:	15352:
" Game	:	:	250:	:	:	:	:	:	:
Total All Counties	1292829:	296273:	634012:	331449:	176167:	252264:	848339:	327413:	486284:

Note: County totals include the entire use of the Routt National Forest in Routt County, and of the White River National Forest in Rio Blanco County.

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A G R E E M E N T

THIS AGREEMENT, made this 24th day of January A. D., 1908, at Baggs, Wyoming, between the Carbon County Wool Growers Association, by its Advisory Board, party of the first part, and the Snake River Stock Growers Association, of Colorado and Wyoming, by its Advisory Board, party of the second part, WITNESSETH:-

WHEREAS, the sheepmen have been entitled to use, and now use, District No. (5) Five, Sierra Madre National Forest, in Wyoming, for sheep grazing and lambing purposes, from May 5th to June 30th inclusive, of each year, and have been accustomed to trail back across said District No. Five (5), at the close of the summer, grazing, and by said trailing back, have depleted the lands so crossed, of the grasses, that are needed for the ranging of cattle, and,

WHEREAS, certain individuals and corporations now own private land holdings in said District No. Five (5), and have used the same in conjunction with the government land for lambing and grazing of sheep, and,

WHEREAS, certain small ranchers possess land holdings and ranches in said District No. Five (5), and believe that they should have the right to graze cattle in said District, and,

WHEREAS, there is a strip of land South of said District No. Five (5), lying between said District and the Southern boundary line of Wyoming, outside of the National Forest, over which the National Forest authorities have no control, and in which there are private land holdings, which have been used for the grazing of sheep, and,

WHEREAS, the aforementioned Stock-Growers Association, and the cattlemen, are willing to grant the sheepmen the right to graze upon a certain portion of the Park Range National Forest lying West of the land in Colorado now used by the sheepmen, said land to be hereafter used by the sheepmen, being more particularly described in a letter from Mr. Thos. Hogan, Supervisor of the Park Range National Forest, to, Mr. J. W. Nelson, Supervisor of the Sierra Madre National Forest, of the date of Nov. 9, 1907, and,

WHEREAS, the said cattlemen desire to obtain the South tier of Sections of District No. Five (5), extending West from the line between Ranges, Eighty Six (86) and Eighty Seven (87) for the exclusive use of cattle,

Now, THEREFORE, in consideration of the premises, and the mutual promises of the parties hereto, the party of the first part, agrees that no one of its members shall range or cause to range, any sheep, on District Five (5) after the 30th day of June of any year, it being understood that this restriction shall be the same as is now enforced in the said District.

It is further agreed by the party of the first part, that no one of its members shall in any manner trail or cause sheep to trail across said District No. Five (5), after June 30th excepting by the trail now laid out by the Forest Service, through the North East Corner of said District No. Five (5), and it is further agreed by the party of the first part, that no one of its members shall use or cause to be used any public government land lying between District No. Five (5), and the Southern boundary of Wyoming, after July 1st of each year.

The party of the second part agrees that it will use its utmost endeavor to secure for the sheepmen of the party of the first part, the additional right to graze sheep in Colorado, within the district proposed by Supervisor Hogan to Supervisor Nelson in letter of November 9th 1907. The party of the second part further agrees to withdraw its demand for the South tier of sections of District No. Five (5) West of the line between ranges (86) Eighty Six, and Eighty Seven (87).

It is further agreed by the said party of the second part that the sheepmen are to have the right to use the trail through District No. Five (5), already laid out by the Forest Service, through the North East Corner of said District No. Five (5).

IN WITNESS WHEREOF, the parties above mentioned have hereunto set their hands and seals, by the members of their Advisory Boards, here present, the day and year first above mentioned.

Carbon Co. Woolgrowers Association

By John A. Donnel, President

H. D. Blydenburgh

W. P. Blackmore

A. M. Ramsey

The Snake River Stockgrowers Assn. of Colo. & Wyo.

H. L. Ellas, President

Ed Wron

I hereby consent and agree to the terms of the above agreement.

Pioneer Sheep Co., W. P. Blackmore

Carbon Co. Sheep & Cattle by A.M. Ramsey, President

Cow Creek Sheep Co., J.K. Harst, Pres.

A. Rasmusson and Son

PRESENT AGRICULTURAL INDUSTRY

Cultivated lands in the Yampa River drainage are devoted almost exclusively to the production of forage crops. This is the status from the standpoint of both acreage and value of crops as shown by the next table. The data are for the year 1933 as reported in the "Colorado Year Book, 1933-1934." The tabulation is based on the entire areas of Routt and Moffat Counties.

<u>Moffat County</u>		<u>Principal Crop</u>	<u>Routt County</u>	
<u>Value</u>	<u>Percentage Area</u>		<u>Value</u>	<u>Percentage Area</u>
2.5	4.4	Corn	-	-
3.9	5.0	Oats	6.2	11.6
1.8	1.6	Barley	2.6	4.4
11.7	11.5	Wheat	8.0	8.4
1.8	4.7	Rye	-	.2
.2	.1	Beans	-	-
9.7	1.5	Potatoes	5.2	.9
.3	.2	Sorghum	-	-
63.5	69.5	Hay	55.0	71.7
.1	-	Fruit	-	-
-	-	Lettuce	16.2	2.3
4.5	1.5	All other	6.8	.5
<u>100.0</u>	<u>100.0</u>	Total	<u>100.0</u>	<u>100.0</u>

The principal dry land crops are small grains and potatoes.

Market Problems

All products of the region have in common a marketing problem caused by the distance from the principal markets and from the shipping points. The nearest general market accessible to the region as a whole is at Denver and this market is from 160 to over 375 miles distant, dependent upon the part of the unit being considered. Then too, the fact that Denver lies on the other side of the Continental Divide and both the roads and the railroad must pass through some very rough terrain to reach that market, contributes to higher transportation costs than the mere distance would indicate. The region is served by but one railroad.

Beef Cattle. Practically all marketing is done outside the area. Local demand is limited and is supplied by dairy and range stock and by high-grade beef shipped in by the packers. The Denver Market facilities and demand are adequate to absorb the present supply of beef cattle.

Lamb and Wool. Sheep possess a marketing advantage over cattle in that the income is from two sources: wool and lambs. Then too, lamb is in a better position, as a rule, to take advantage of market fluctuations than beef, on account of the concentration of sheep into flocks, which eliminates the necessity of "gathering."

Hay. The distance from markets and the high cost of shipping limit the possibility of marketing this product outside the region. It is true that some hay is trucked to neighboring regions and that in years of extreme scarcity and high prices it may be profitably shipped to more distant markets, but these circumstances are not the rule and do not affect the basic truth of the original statement. Quarantines, on account of the alfalfa weevil, also restrict shipment of hay to points outside the area. Many of the irrigated hay meadows are some distance from the railroad. In the case of such ranches, the long haul necessary to get hay to a railroad point makes shipping uneconomic even in the years of greatest scarcity. Woolgrowers on the winter ranges use very little hay. They prefer the feeding of corn, cottonseed cake and similar concentrates.

Grain. In the opinion of the local county agents, grain from this region cannot compete very successfully with that produced on the eastern slope of the Rockies, on account of the adverse transportation cost differential. An effort is being made to overcome this obstacle by raising certified seed and thereby finding an outlet in the higher price classes.

Markets fluctuate greatly. Often grain, even wheat, is raised as a two-way crop--if the market is high, the grain is shipped; if the market is down, the grain is fed to livestock.

The fattening of lambs and the "warming up" of stock for shipping, provides an outlet which is apparently becoming more important yearly and the possibilities of which merit further study.

Dairy Stock, Swine, and Poultry. Ranches at the higher elevations in this area are well adapted to dairying and the scope of this industry has been increased in recent years. Local creameries and a cheese factory at Steamboat Springs absorb a large percentage of the cream.

The number of swine on farms could be increased, according to extension workers.

There is little prospect of competing with outside poultry markets.

Method Used in Computing Average Production
of Cultivated Forage Crops

Areas. The basic areas by counties of dry-tilled, irrigated lands, etc., were taken from status and county assessors' records.

In determining the division of these acreages among the principal forage crops, the 1929 census data were chosen as a basis for the following reasons: (1) The Division of Crop and Livestock Estimates considers them more accurate than certain other statistics; (2) they represent the acreages in a fairly normal year uninfluenced by drought and depression.

Since computation of acreages showed that in Routt County, 93.35 per cent of the dry farm area and 91.22 per cent of the irrigated area are within the project, these percentages were applied to the 1929 census acreages for the county to arrive at the acreages of each crop in that part of the county within the project. Since Rio Blanco County farm conditions compare closely to those in Routt County, the division of cultivated lands between the various crops was assumed to be the same. Of the gross area of Moffat County, 91 per cent is within the project area. The percentage of cultivated land within the project area is unknown but is probably much higher. The gross 1929 census acreages of cultivated lands were arbitrarily reduced 4.1 per cent, a percentage indicated by computation of cultivated acreages, to allow for cultivated lands outside the project area.

Yields. In computing the average yields of the various crops, the yields given by the census were considered a better basis than the yields recorded in the Colorado State Year Book.

These yields were adjusted to the ten-year average by applying to them the percentage which the ten-year average yield--1920 to 1929--as computed by the Crop Reporting Bureau was of that Bureau's 1929 yield. For all grains, both dry and irrigated, these percentages were computed from data for the counties involved. Since county data were not available for hay, the state averages were used instead. The percentages applied to the 1929 census yields for the two counties to arrive at the average yields were:

	<u>Routt County</u>	<u>Moffat County</u>
Wheat, dry	81.4	76.2
Wheat, irrigated	81.8	78.1
Corn, dry	100.	78.0
Corn, irrigated	95.5	78.0
Barley, dry	87.4	82.2
Barley, irrigated	82.6	80.8
Oats, dry	88.8	94.6
Oats, irrigated	78.1	80.0
All Hay	93.0	91.0
All Rye	90.0	90.0

Routt County yields were applied to the cultivated lands in Rio Blanco County within the project.

Since but one yield was available for alfalfa, the average for both dry and irrigated, this yield was applied to alfalfa raised on each of these types of land.

Production. Average production was obtained by multiplying average acreage by average yields.

Carrying Capacities in Cow Months. The following supplements data in the text of the report on methods used in computing capacities:

Grain. An analysis of actual feeding tests made by the personnel of the Bighorn National Forest indicates that 800 pounds of grain have the same feed value as one ton of hay. Since in actual feeding, not more than 100 pounds of grain is fed per month, except for warming up, we have assumed that for each 100 pounds of grain fed, 550 pounds of hay must be fed in conjunction. In all counties, ample supplemental hay is available for feeding the grain which is estimated to be available for feeding range stock.

The following bases were used in computing the amount of grain available for increasing the carrying capacities of range stock:

Wheat. Observations indicate that wheat is raised within the area as a two-way crop. That is to say, when wheat prices are high, much of the wheat will be shipped and sold; when the wheat market is down, this grain will be fed out to livestock. It was considered, therefore, that at least 25 per cent of the wheat was fed in the average year. Bushels were converted to pounds on the basis of 60 pounds to the bushel and 25 per cent of the average production was considered available for winter feeding.

Grains Other Than Wheat. The prorated average weight per bushel was found to be 37.5 pounds and the bushels produced were converted to pounds on this basis. From the total production, the following deductions were made: (1) It was estimated that 20 per cent of the cattle shipped or 4,500 head could well be fed 360 pounds of grain per head for warming up. Dividing this number of stock among the counties on the basis of their cattle population, the available grain was reduced 891,000 pounds in Routt County, 615,600 pounds in Moffat County, and 113,400 pounds in Rio Blanco County. (2) Allowing four pounds of grain per day per hog for the number reported in the 1935 census resulted in a reduction of 3,147,760 pounds in Routt County, 1,241,000 pounds in Moffat County, and 129,940 pounds in Rio Blanco County. (3) An allowance of 250 pounds per horse per year to the number of horses reported in the 1935 census resulted in a reduction of 1,394,500 pounds in Routt County, 1,492,000 pounds in Moffat County, and 57,250 pounds in Rio Blanco County. (4) An allowance of 400 pounds per dairy cow to the number of such stock shown on the assessors' records to be within the area gave a reduction of 1,174,400 pounds in Routt County, 644,000 pounds in Moffat County, and 11,600 pounds in Rio Blanco County.

After the reductions were made the balance was considered available for winter feeding to range stock.

Some of the data used in computing range capacities will be found in Table C.

TABLE C (1)

WINTER RANGE - MOFFAT COUNTYCARRYING CAPACITY

F. A. Requirement - .064

SHADSCALE TYPE

Transect No.	Forage Acre Factors		Carrying Capacity	
	Cattle	Sheep	Surface Acres Per Cow Month	Sheep Month
N 4	.01273	.02176		2.95
N39	.00899	.01363		4.71
N38	.01181	.01746		3.66
L 1	.00995	.01353		4.74
L 6	.00846	.01832		3.50
L16	.00723	.01072		5.99
L22	.01116	.01747		3.67
N45	.01980	.02873		2.23
N46	.01170	.02402		2.67
N47	.01660	.02331		2.75
N50	.02153	.02856		2.25
N52	.01634	.03017		2.13
N53	.01212	.02383		2.69
N55	.01930	.02839		2.26
Average	.01341	.02142		3.00

GREASEWOOD TYPE

N 5	.00939	.02351	2.73
N25	.00696	.01644	3.90
N40	.00751	.01881	3.41
L 2	.00322	.00833	7.70
N48	.01392	.03079	2.08
N63	.01055	.03180	2.02
Average	.00859	.02161	2.97

(1) Compiled by the Central Rocky Mountain Forest and Range Experiment Station from field data obtained by range examiners of the Division of Grazing, Department of Interior.

TABLE C (Continued)

SPRING-FALL RANGE - MOFFAT COUNTYCARRYING CAPACITY

F. A. Requirement = .186

SAGEBRUSH TYPE

Transect No.	Forage Acre Factors		Carrying Capacity Surface Acres Per	
	Cattle	Sheep	Cow Month	Sheep Month
N 1	.01740	.02380	10.70	
N 2	.01614	.02061	11.54	
N 6	.01682	.02665	11.07	
N 8	.01358	.01839	13.71	
N 9	.01426	.02186	13.06	
N10	.02821	.03491	6.60	
N11	.01443	.02184	12.90	
N12	.00843	.01614	21.96	
N13	.00824	.01686	22.60	
N14	.01688	.02761	11.03	
N15	.02473	.02420	7.53	
N16	.00703	.01410	26.49	
N19	.01698	.02642	10.96	
N20	.01550	.02433	12.01	
N21	.00564	.00845	33.01	
N22	.01371	.02588	13.58	
N23	.00885	.01848	21.04	
N24	.01002	.01707	18.58	
N26	.01166	.01829	15.97	
N27	.00663	.01658	28.08	
N28	.00992	.01930	18.77	
N29	.01322	.01812	14.08	
N30	.00911	.01992	20.44	
N31	.01151	.02140	16.18	
N32	.00946	.01882	19.68	
N33	.01355	.01931	13.74	
N36	.00737	.01843	25.26	
N37	.01460	.02370	12.75	
L 5	.01969	.02123	9.46	
L 7	.01313	.01907	14.13	
L10	.01802	.03263	10.33	
L11	.01312	.02175	14.19	
L12	.01948	.02786	9.56	
L14	.01287	.02347	14.47	
L20	.01558	.02682	11.95	
N49	.02047	.02915	9.10	
N51	.02076	.02769	8.97	
N57	.02946	.03265	6.32	
N59	.02067	.02919	9.01	
N62	.03200	.04426	5.82	
Average	.01498	.02293	12.43	

TABLE C (Continued)

PINON-JUNIPER TYPE

Transect No.	Forage Acre Factors		Carrying Capacity	
	Cattle	Sheep	Surface Acres Per Cow Month	Sheep Month
N17	.01046	.01858	17.80	
N34	.01286	.01638	14.48	
N35	.01377	.01765	13.52	
N41	.01304	.01708	14.28	
N42	.01390	.01834	13.40	
L 3	.00167	.00422	111.50	
L15	.01199	.01591	15.54	
L18	.00244	.00912	76.31	
L19	.01507	.02009	12.36	
L21	.00784	.01539	23.75	
N43	.01208	.01732	15.41	
N44	.01725	.01857	14.60	
N54	.01309	.01808	14.22	
N56	.00684	.00812	27.22	
N60	.00524	.01039	35.53	
N64	.00909	.01596	19.82	
N65	.00829	.01384	22.46	
Average	.01002	.01500	18.58	

CHAPARRAL TYPE (Oak brush)

N 3	.05039	.06926	3.70	
N18	.04430	.07218	4.20	
L 4	.02689	.03895	6.92	
N58	.03106	.03584	5.99	
Average	.03816	.05406	4.88	

SUMMER RANGE - MOFFAT COUNTY

F. A. Requirement - .175

CHAPARRAL TYPE

N 7	.04443	.04239	3.94	
L 8	.04804	.09907	3.65	
L 9	.04767	.05717	3.68	
L13	.04341	.05338	4.04	
Average	.04589	.06300	3.82	

ASPEN PONDEROSA PINE TYPE

N61	.05431	.05612	3.22	
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FOREST SERVICE
LIBRARY, REGION TWO

TABLE D

SUMMARY OF PRIVATE LAND PRODUCTION OF FORAGE CROPS

	: Routt	: Moffat	: Rio Blanco:	
	: Co.	: Co.	: Co.	: Total
Production Timothy - Clover Hay:	:	:	:	:
Average Acreage (All irrigated)	: 36,273:	4,947:	2,382:	43,602
Average Yield - Tons per acre	: 1.88 :	1.51 :	1.88 :	1.84
Average Production - Tons	: 68,193:	7,470:	4,478:	80,141
Production Alfalfa Hay:	:	:	:	:
Average Acreage (Irrigated)	: 1,841:	7,344:	52:	9,237
Average Acreage (Dry-till)	: 7,365:	6,009:	210:	13,584
Average Yield (Irrigated and Dry)	: 1.51 :	1.54 :	1.51 :	1.52
Average Production - Tons	: 13,901:	20,564:	396:	34,861
Production Native Hay:	:	:	:	:
Average Acreage	: 1,550:	3,863:	49:	5,462
Average Yield - Tons per acre	: 1.04 :	.98 :	1.04 :	1.00
Average Production - Tons	: 1,612:	3,786:	54:	5,452
Production Grain Cut for Hay:	:	:	:	:
Average Acreage (Dry-till)	: 4,207:	6,678:	117:	11,002
Average Yield - Tons per acre	: 1.06 :	.84 :	1.06 :	.93
Average Production - Tons	: 4,495:	5,610:	124:	10,229
Production Grains Other than Wheat:	:	:	:	:
Average Acreage (Dry-till)	: 12,444:	5,717:	359:	18,520
Average Yield (Bu. per acre)	: 27.42 :	17.37 :	27.42 :	24.18
Average Production - Bushels	: 342,241:	99,304:	9,844:	451,389
Average Acreage (Irrigated)	: 986:	1,132:	74:	2,192
Average Yield (Bu. per acre)	: 28.11 :	32.77 :	28.77 :	30.60
Average Production - Bushels	: 27,716:	37,292:	2,080:	67,088
Production of Wheat:	:	:	:	:
Average Acreage (Dry-till)	: 6,575:	11,076:	184:	17,835
Average Yield (Bu. per acre)	: 15.03 :	9.96 :	15.03 :	11.87
Average Production - Bushels	: 98,882:	110,317:	2,766:	211,965
Average Acreage (Irrigated)	: 77:	490:	- :	567
Average Yield (Bu. per acre)	: 20.72 :	32.98 :	- :	32.70
Average Production - Bushels	: 2,369:	16,160:	- :	18,529
Average Acreage of Non-Forage Crops:	:	:	:	:
(Mostly irrigated)	: 2,424:	1,004:	- :	3,428
Average Acreage of Crop Failure	: 1,479:	2,118:	- :	3,597
Average Acreage of Fallow	: 8,072:	14,959:	- :	23,031